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The INDUSTRIAL-ARTS MAGAZINE

DECEMBER-1925

The Bruce Publishing Company
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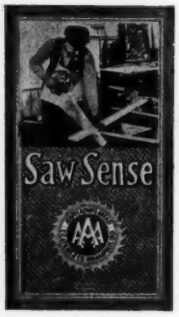

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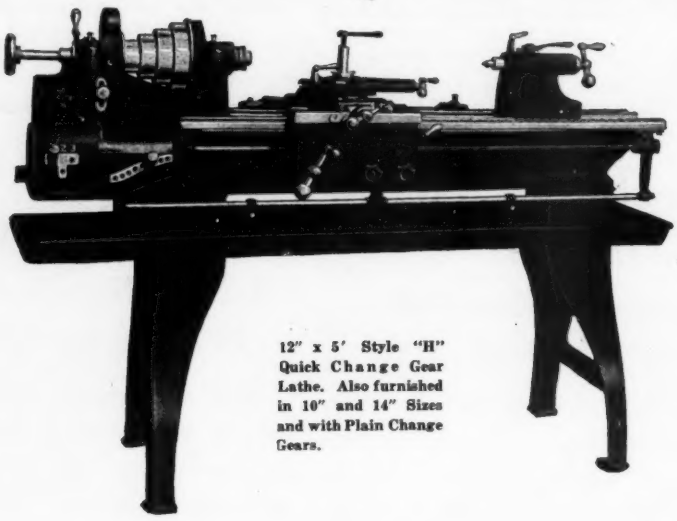

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THE INDUSTRIAL ARTS MAGAZINE

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Difficulties Encountered by Young People on Leaving School and Entering Industry

R. W. Tarbell, Milwaukee, Wis.

THE boys and girls of the present generation are facing many problems as they take up the work of life. It is not such an easy matter as one might think. There are numerous hurdles to jump over, before they are safely and permanently inducted into industry. As society becomes more complex, these difficulties appear to increase. There are more restrictions thrown around employment today than was the case a few years ago. The safety and best interests of children are matters of general concern and the state is anxious that each young person shall have a fair chance to start right. But, there are certain factors over which society seems to have little control, and these are operative in practically every case. They are obstacles which must be met and overcome before success can be attained.

The work of the teacher is not done when his pupils pass out of the schoolroom. His interests should be bound up with theirs, for the work of the school is not finished until the pupil is ready for complete living. Pupils can be prepared in part for the workaday world by instruction in the schools. Some of it will need to come by experience on the job. The teacher should be cognizant of all these elements of difficulty and be prepared to counsel wisely. An understanding of the following items provides an appreciation of the problems which face young people as they enter industry.

1. Placement

(a) *What kind of work to enter.* Probably the first question of major importance centers around the selection of a job. The older generation went to work as employment gave the opportunity. While there was considerable conscious preparation for the vocations, still a great many people drifted from one job to another, until the force of circumstance or inertia held them permanently in one position. Unfortunately there are far too many examples of this haphazard method of choosing in evidence today. The misfits in the various walks of life are proof that some unwise choosing took place in former years. Society is becoming more concerned about this matter and is saying that the waste must stop. Pupils must be more carefully and definitely prepared for a vocation and must be assisted in choosing an occupation suited to their capacities. This at once opens up the whole program of counselling.

(b) *How to apply for a position.* It is a far cry from the days of the small plant to the gigantic organizations of the present. It was possible then for pupils to enter the front door of the little factory, speak directly with the responsible heads, and be put to work. Those days are gone. The large systems of the modern factory have detailed the duties in a way that appears confusing to the outsider. Many a youthful aspirant has approached the factory gate, seeking employment, and has found only the usual sign, "No Admittance. Apply at Office." The office appears forbidding. It takes considerable courage to go in and ask for work. Here is where the school, through its employment department, can assist greatly in paving the way for junior workers.

(c) *Changing positions.* It is a matter of common knowledge that a very large turnover exists in juvenile employment. Part of this is due to the seasonal nature of many occupations, and part to the unsettled nature of the workers themselves. Some are not suited to the work and are discharged. The process is continuous and each time a change is made the same old problems of placement arise again.

2. Strange Atmosphere of Industry

(a) *Noise and hurry of manufacturing.* Most everyone is confused at first by the hurry and bustle of a strange industrial plant. Everything is new and unusual. It is difficult to distinguish the essentials from the minor matters. It is more difficult for an amateur to see the purpose of it all. Pupils who have just come from the quiet of the schoolroom will find this new atmosphere almost overwhelming. It will be hard to make adjustments to the excitement of work.

(b) *New methods of procedure.* Pupils begin to learn as soon as they enter upon employment. The rate of learning may be more rapid for a time than it was in school. The beginner cannot fail to be impressed with the way in which things are done. Machinery and modern equipment furnish many a surprise for him. A sense of bewilderment is likely to over-

take him during the days when he is becoming adjusted to the new processes. This is indeed a necessary part of his education, but it is also a time of perplexity and difficulty.

(c) *Practical methods instead of theory.* When pupils leave school for industry they carry a more or less complete stock of ideals. It is well that the school has been able to equip them with fundamental viewpoints. If they have taken some practical courses, such as shop or commercial work, they will have some notions of their own about how things should be done outside. They will usually be destined to disappointment, for the theory learned in school can scarcely be applied, unchanged, in the plant. Every occupation will have its own methods of practical operation, made up of basic ideas. It is not to say that the preparation in school is useless, but that no school can do more than provide the fundamental skills and information, which must be applied according to the local requirements of industry. It will be necessary for pupils to go through this transition stage and give up a few pet notions in favor of the practical, though uninteresting, methods of production.

(d) *New terminology.* Every occupation has words that are peculiar to it. A part of the training of a young worker consists in learning the trade terms. To an experienced employee these words are commonplace. He uses them glibly, without special effort or thinking. It is different with the novice. He is confronted with a new set of words wherever he turns and often gets them mixed up, much to his chagrin. Learning his shop vocabulary is a problem of no small consequence.

3. Different People

(a) *The foreman.* It should not be necessary to list the foreman as a difficulty, which young workers must meet, as they enter the door of employment. Viewed from the standpoint of youth, however, the foreman constitutes a problem for some people and is not easily understood. It may be due in part to the nature of the work and the necessity for impersonal ruling. It is sometimes due to the personality of the foreman. In any event the beginner often fails to understand the foreman. This misunderstanding may extend over a short period or may crystallize into permanent dislike.

(b) *Expert and inefficient employees.* Before entering employment the beginner has largely acted as an individual. It is true he has been cooperating with fellow students in the various activities of the school, but this has been mostly on the play level. Also, the responsibilities of school have not been so severe. He is now suddenly thrust into a group of juvenile and adult employees and must begin to learn from them. Their standards of workmanship vary and he is at a loss to know whom to follow as a pattern.

(c) *Eccentric employees.* Judging workmen from the standpoint of efficiency is not the only difficulty which confronts the youth. There are personal idiosyncrasies which may be even more baffling. There will be people with a peculiar appearance, so odd in some respects as to attract the attention of new employees. Others will have eccentricities of speech or mannerisms that are exceptional. Some will have a perverted viewpoint on social problems and will proceed to convert folks to their philosophy as rapidly as possible. It may take a level head on adult shoulders to properly estimate the value of all this. It is therefore a difficult problem for youth.

(d) *Taking orders.* Our educational systems at the present time seem to be drifting more toward the individual freedom and movement of pupils. Independent thinking and personal initiative are encouraged and fostered by the schools. This is all very well and perhaps in line with the best in educational practice, but it often develops a state of mind that is troublesome when the pupil goes to work. In order to be successful, an industry must be carefully organized from top to bottom. Each department is responsible for certain work and every person has certain duties to perform. If a single individual fails to do his part, the entire organization is disturbed. This does not always appear clearly to some people. In the final analysis, each one must obey the orders of his superior and work as a member of a team. This is somewhat irksome to the pupil who has been developing his initiative in school and now wants to do things in his own way. It may be difficult for him to obey orders without question and, for this reason, he will be doomed to disappointment during the first few weeks.

4. Monotony of Work

(a) *Long hours.* Many a young person has looked forward eagerly to the day when he will lay aside his books and go to work. Perhaps we have all experienced the ambition. It did not take long, however, to disillusion us. In school the hours were from nine to four and this time was broken up by recesses, recitations, and study periods. There was a diversity of experience in school which made the time go quickly. In the plant or store it is different. The hours are longer and there are fewer intermissions during the day. The long work period will prove monotonous to the beginner for some time.

(b) *The humdrum job.* Most any kind of work is interesting at first. It is new and strange to the beginner. But he is not capable of doing anything except simple work. The very simplicity of the occupation will soon prove tiresome as he sees nothing ahead but repetition of the same processes. The novelty soon wears away as each new day brings the same old story This is deadening, and yet the learner must become accustomed to it, if he expects to remain at work.

(c) *Learner and producer.* Before entering industry the pupils were experiencing ideal situations. This has already been mentioned. They were taught to learn from each activity. Every job had its quota of useful information and pupils were constantly looking for the whys and the wherefores. They enter upon em-

ployment still wanting to study the reason for things. This is especially true where there is applied technical science in the work. But there is no time for production to lag while pupils follow their fancies. The work must go forward according to schedule. The employee becomes a producer and must keep on going at a regular rate, even though it be a dull routine. It often means a reconstruction of his physical and mental habits and may be especially irksome to the ambitious and vivacious pupil.

(d) *Homesickness for school.* There is another factor which enters here to make the job seem monotonous. It acts partly as an independent force and partly as a result of the three items of discouragement just mentioned. The young worker sees his associates on their way to school, hears them tell about the interesting events taking place, and pictures to himself the happy days he has given up. School begins to loom up as a great chance and a much more desirable occupation than the one he is now in. Discouragement begins to crystallize and he may quit to go back to school. He may do some faulty reasoning, decide that the job is to blame, and go elsewhere to work. It is a period of uncertainty and rather perplexing for an inexperienced young person. A steady hand and kindly advice are necessary to guide him over these difficulties.

5. Disappointments

(a) *Hard work.* We could scarcely mention the several foregoing adverse factors without admitting that there are some real disappointments during the initial stages of employment. There are some special kinds of disappointment confronting the beginner. He has no doubt pictured the job as one where he could display his strength and skill to advantage and has not thought about the tired limbs and aching back. But fatigue comes, and with it comes the bald truth that the job is not so rosy after all. Some work is hard and a young employee will go wearily home for many a night before he is accustomed to it.

(b) *Little advancement.* Too often a young person goes out to work with the impression that success is just around the corner. He has built up notions of one promotion after another, as he rapidly goes upward along the road to achievement. In the very nature of things this cannot happen to many people. Most of us must be content to climb slowly. When a change of position and an increase in pay do not come in a few weeks, he may begin to chafe and to feel that he is not getting a fair chance. It is all because of a false view of things, which he has been building up before going to work. He will need to learn that advancement comes only after long, faithful service.

(c) *General disappointments.* Aside from the two specific disappointments just mentioned, there may be several factors contributing to an unhappy state of mind. The items mentioned under headings two, three and four, may cause little more than surprise at new experiences. They may, however, result in a feeling of disheartenment and dejection, as the youth comes to the conclusion that he has made a bad move and that it is too late to change.

6. Physical Difficulties

(a) *New muscular adjustments.* We have already touched upon the fact that some work is tiresome and that aches and pains will be part of the experience of employment. The muscles tire because they are not used to the new movements and strains. It will take some time before the muscles become habituated to the new exercises.

(b) *Shop fatigue.* Growing out of new muscular strains is the fact that muscles develop a fatigue poison during the process of work. This poison is carried off in the blood stream and exhaled from the lungs or otherwise disposed of. When a person exercises too much, the poison collects more rapidly than it can be carried away and a feeling of fatigue overtakes one. As a workman becomes accustomed to a job, with its new set of muscular activities, his body gradually builds up a resistance to this poison and is able to dispose of it almost as rapidly as it is formed. The beginner may plunge into work with little discretion and tire himself needlessly.

(c) *Overcoming inertia.* It is hardly correct to say that young people are lazy and yet they sometimes give evidence of it. It can be traced quite frequently to a physical disturbance, resulting from tired muscles or a rapidly growing body. The result is a general tired feeling and the appearance of listlessness. It seems to be lack of strength and ambition. It is, in fact, a purely physical condition, which will wear away in time, but which is very annoying while it lasts.

7. Skill

(a) *Lack of ability.* People enter industry with varying amounts of preparation. They are not all alike, for some are better equipped than others. Ambition and high purposes will go a long way, but will not make up for a lack of skill. The youth of little skill has a great deal to learn before he can expect to compete with others. Inability to do the work is a handicap of no small consequence and is one of the initial difficulties.

(b) *Production speed.* After the beginner has learned to do a certain kind of work correctly, he is often jolted from his state of contentment by the fact that he must speed up. Modern industry must be carried on at a fairly rapid rate to compete in the market. Each employee must not only work accurately but at the required rate. This is something that will come with practice and sometimes after a number of discouraging attempts.

(c) *Studying the job.* Education continues throughout life. Everything we do increases our knowledge or modifies our viewpoints. The school does not give all the learning experience. When a person starts to work he finds new things to learn. Modern industry and large mercantile organizations are so complex, and are changing so rapidly, that an employee must be ever watchful and studious, if he would keep

abreast of improvements. It is not enough to merely obtain a position and go to work. It is necessary to keep studying the job, if advancement is to be made. This may require reading and observation outside of work hours. It certainly means extra effort and there are many young people who prefer to take the easy road. This explains why some are discouraged at the slow progress they make.

8. Social and Economic Difficulties

(a) *Getting used to work clothes.* There seems to be something inherent in human nature which tells us that some occupations are to be shunned, if not despised. The lines of work where dirty clothes are necessary are frequently considered undesirable. Most people feel that they could use more leisure, if they could afford it. This is reflected in the attitude of youth. It is difficult to give up the clean clothes of school and put on the apparel of the factory.

(b) *Handling wages.* Another difficulty arises from the pay envelope. Many young people have had little, or no money, of their own until they started to work. It is probably a fortunate thing for most of them that parents or guardians take charge of the earnings for a while and assist in a proper disposition of the money. But some are allowed to use it as freely as their whims may dictate. This is a lamentable situation and frequently results in reckless spending. Habits of extravagance are easily developed and may last a lifetime.

(c) *Social ostracism.* Adolescent youth is very sensitive. It is very much concerned about its prestige. This varies considerably with individuals, but they are usually anxious to retain the respect of their associates. As a young person dons overalls and goes to work he is apt to lose caste with his former associates in school. They may actually look down upon him, criticize him for leaving, and drop him from their set, or he may imagine that they have done so. It is a false viewpoint for either side to take, but it may be very real in its effect on him, and prove to be of some importance.

9. Understanding the Purpose of Industry

(a) *Industry is for dividends.* There are various attempts being made in recent years to introduce the spirit of service and the Golden Rule into industry. Some of these are succeeding very well. The humanitarian spirit seems to be growing. There is, however, the one basic purpose behind all enterprise and we cannot deny it. Business is run for profit. Dividends must be earned or the life of the organization will cease. This is equivalent to saying that service must be properly rewarded. Applying this principle throughout the plant means that each employee is either making or wasting profits. He should become a producer in the true sense of the word. This point of view is not always clear to young people and may cause a feeling of disappointment when the significance of it becomes apparent.

(b) *Fluctuations.* Business is dependent upon its customers and must cater to the demands of the trade. The beginner often has the notion that a factory keeps on making things and puts them in the storehouse until sold. We know that a careless system of this kind would not pay. As business is brisk or slow there will be rush or slack times in the plant. There will be periods of layoff, with men coming and going. There will be changes in methods of production and assignments to different jobs. Young people will often be put on other work without becoming fully conversant with the old job. This may seem unnecessary to them and be out of harmony with their ideas of how things ought to be done.

(c) *Difficulties of orientation.* We have touched upon a number of items which make the beginning days at work more or less of a burden. There is another factor which grows out of the very nature of industry itself. When work was simple it was a comparatively easy matter for an outsider to come in and adjust himself to his surroundings. Processes are much more complex now and still the workman comes with the same meager preparation. This makes a larger gap between his initial knowledge and satisfactory understanding. It will be hard for him to see the relative importance of different things. For this reason an immature youth may not see the necessity of correct work in details, or why priority in processes is essential. He does not grasp the movement of the work as a whole.

10. Morale

(a) *Attitude toward associates.* We now come to a very human side of the discussion. People work together in groups. It is necessary to associate with other folks in factory, store, and office. Much of one's success will depend upon how well he can get along with fellow workmen. The youth is very pliable, physically, mentally, and morally, when he starts to earn his living. He can scarcely be expected to know the details of proper decorum in his relations with other employees and superior officers. He may learn through bitter experience that certain actions are not proper.

(b) *Judging shop conversation.* The idle moments at noon and during the day will be productive of interesting and rich experiences for him. It will not always be the best, but his mind will be keen to take in much of what is going on. Older employees frequently criticize men and methods from one end of the organization to the other. The statements may be true or false, but it will be hard for the beginner to appraise them correctly. Insidious propaganda is sometimes started and ensnares the unsuspecting youth. Keeping cool and unmoved in the midst of these adverse forces is indeed a difficult matter.

(c) *Boosting vs. knocking.* What a wonderful day it will be when people work together instead of pulling in opposite directions! One of the big things to learn in life is to assist the other fellow unselfishly and speak a good word for him. The spirit of the booster is a most inspiring thing and casts a beneficent influence on associates far and near. The knocker is not needed in society anywhere and should be accorded

a cold shoulder at every turn. Many people, both old and young, fail to distinguish properly between these two types.

(d) *Loyalty.* This last item should go without saying. No employer can have full success unless he is sure of the unqualified support of his workmen. As the individual sees things going on that are detrimental to the best interests of the proprietor, he should report them, as an honest employee. This seems difficult for the youth to do, especially if he has been schooled in the philosophy that it is dishonorable to "squeal." Sound thinking will prove that society cannot exist without organized loyalty, for as Kipling has said,

"The strength of the pack is the wolf,
And the strength of the wolf is the pack."

Reporting insurrections is not tale-bearing, but the duty of each employee.

Conclusion: It may seem unfair to paint a picture as pessimistic as this appears to be. It looks as if the road to work was all uphill and full of thorns and rocks. There are many bright sides, but it is not the purpose of this article to present them. Neither is it the purpose here to point out specific ways to cope with the situation. Obviously the schools can assist, especially the vocational schools. Teachers have a responsibility for helping young people to weather the adverse currents that beset them during the transition stage from school to industry.

Does the Job Sheet Tend to Prevent Initiative?

Are Industrial Teaching Methods Imitating the Standardization of Academic Subject Instruction to the Sacrifice of Individual Initiative Which Should Be Their Chief Value?

C. E. Hedden, Harrisburg, Pa.

ONE of the strongest claims made for practical arts as a feature of the public school curriculum is that it permits greater individuality in thinking and expression, due to the wide variety of possible solutions of specific problems. For example, a specific project in wood, such as the broom-holder, taboret, umbrella stand, book-rack, etc., permits of a wide variety in design while still answering the fundamental requirement of being a broom-holder, taboret, umbrella stand, or book-rack.

The encouragement of variety in design would promote the individual initiative which is claimed for this type of instruction without necessarily sacrificing in any way the requirements of workmanship, good proportions, or finish. The exact dimensions of the tin cup or funnel made in the sheet metal shop, do not seem to the writer to be as fundamentally important as the operations involved, which will be the same irrespective of dimensions.

There seems to be, however, particularly in the field of industrial arts, a very distinct tendency toward standardization in the assignment of problems and projects, which, while unquestionably making easier the work of the instructor, must also inevitably reduce the opportunity and need for individual thought on the part of the student. It is naturally much easier for a teacher to distribute to his class a set of job sheets, in which the sequence of every operation has been carefully thought out *by the instructor* and put down in order, with a sketch on the sheet giving all dimensions so that all that is required of the student is to read and follow directions than to assign as the next project a "taboret."

Let us for a moment picture the results of the two assignments and see what conclusions, if any, may be drawn from the two pictures.

In the case of the first assignment the boys read over the job sheet. In the shop where this general type of assignment is given, you will probably find the required lumber all ready milled to the approximate size and form required by the job sheet and ready to hand out to the boy in uniform multiple from the time the job sheet is handed out until the final O. K. of the instructor is placed on the finished project. There is no variety of individuality or initiative possible. All of the boys get their stock at the same window. The operations are all sequential and uniform. The design and dimensions are all alike. The stain and finish are prescribed on the job sheet and the only difference in the final products are those determined by individual skill and expertness. And the only use for the instructor is to tell the boy when his work is or is not acceptable assuming, of course, that the boy is able to read his job sheet.

But what happens when the instructor announces that "the next job will be a taboret?" In the first place it is conceivable that about half of the class will not know what a taboret is and not having a carefully drawn picture of one on a job sheet stating "this is a taboret" they immediately appeal to the instructor in chorus "what do you mean, taboret?" And if we believe the provoking of a question is the best first step in education, then the education for this particular project for at least fifty per cent of the boys has begun. And the method of answering this question offers the first opportunity for a most unfortunate mistake on the part of the instructor who, in many cases, will display a drawing, a picture or a sample taboret, thereby giving the boys an indelible impression and practically insuring the fact that 75 per cent of the taborets made will be similar to and probably as much like the illustration shown as the memory of the student will permit. An infinitely better way is to describe in words and by its use, what a taboret is, permitting the boy to picture the project in terms of the *purpose it is to serve.*

And next, in a crowding confusion, come the ques-

tions, "how high?"; "how large?"; "what shape?"; "how many legs?"; "how many shelves?"; "what kind of wood?"; "how held together?" To all of these questions the instructor has one answer: "Assume that you are making it for yourself and make it meet your own specifications." Each individual boy will then begin to think of the project as filling a definite place or purpose in his own home and the answer to every one of the questions mentioned above will be made in terms of adaptability to a specific and *individual* situation. The dimensions, material, and finish will be affected by the home environment, including the finish of the woodwork, and the amount of money which the boy has or wishes to spend on the project.

There will probably be as many kinds of taborets as there are boys in the class. Some will be stronger in design than others, some will be more attractive in design than others, some will exhibit better workmanship than others, but every taboret will represent at every step the individual thought and initiative of the boy who made it. Those who have adopted the better designs will feel a natural pride in their achievement and their projects will be a natural suggestion to the others.

And what has been the teacher's job in the second picture? By an almost continual use of the question "why," as the boys ask his advice on detail after detail, the good teacher will force the boy to think through and discover a reason for what he proposes to do. For example, when the boys ask regarding the shelves of the taboret "square, round, or hexagonal," the wise teacher replies, "why, make it either the one or the other," thus forcing the boy to discover a *reason* of his *own*, based either on an adopted type of construction or an ideal of appearance for selecting one shape as against the others. When the boy asks, "what kind of wood," the wise instructor comes back with, "why, make it one kind rather than another," thus forcing the boy to develop a *reason* of his *own* based on a consideration of durability, appearance, or possibilities of finish for selecting one wood as against other possibilities. And thus at every step, as has been said before, the wise teacher forces a selection which must come as a result of individual thought and the weighing of pros and cons by the boy in developing a project which, while fulfilling the fundamental requirements of the course, also meets his own individual specifications.

And now the question: Can this type of teaching be done in connection with the use of a job sheet? Can a job sheet be so organized as to present a general problem and leave the selection of details to come as a result of individual thought and determination on the part of the student? Unquestionably the job sheet is of most valuable assistance in reducing the group multiple to a unit basis in the assignment of work and directing of operation, thus relieving the teacher of the multitude of individual questions incident to the other method of instruction. Unquestionably also, however, in the opinion of the writer at least, the use of a job sheet such as described in a former paragraph, while thus relieving the teacher, certainly reduces to a minimum the required student thought and initiative. Can the job sheet provide the one advantage without involving the disadvantage?

In the opinion of the writer, it can. And it is the purpose of this brief article to attempt to point out the way to the makers of job sheets in order that they may, insofar as possible, aim to make them square with these two requirements. Referring again to the very same but still quite typical woodworking project, the taboret: a job sheet can be developed which would have as its title the single word "Taboret" and beneath this, at the margin, the words "Student Definition" and with room left for the writing of the definition; a printed statement, obviously unsequential, of the decisions which must be made by the student making his sketch for the approval of the instructor, such as material, size, shape, type of construction, finish, etc. If the instructor, in assigning such a job sheet, would state that each of these items is to be considered and the decision filled in on the job sheet and the sheet then handed to the instructor for his criticism and suggestions, such a job sheet would then report the initiative and originality of the *student* rather than that of the *instructor* in designing a taboret. And with the instructor always available to watch and check by the previously suggested continual use of the word "why," there need be no danger of the less capable students either designing or executing a monstrosity of which either student or teacher need feel ashamed.

Yes, it is possible to use job sheets without abusing the student's initiative. But, the types of job sheets which have come to the attention of the writer during the last year or two have tended very strongly in the other direction, and it would seem that a warning note on the general philosophy of the job sheet is in order at the present time.

A FERNERY MADE BY STUDENTS IN THE MILWAUKEE STATE NORMAL SCHOOL.

Occupational Diseases

Joseph R. Strobel, Cleveland, Ohio

A LARGE force of painters were engaged in redecorating one of the city schools. One of the workmen in his off minutes came into the woodworking shop and seemed greatly interested in the work of the boys. After a casual remark to some of the students he turned to the instructor and said, "I'd give anything if I had had the chance those boys have. I am still in the working period of my life, but it will be just a year or so and I will have to give up my trade, painting, and find something else to do. What can I do? I am too old to start another trade." Following this remark was a dry-cackly cough. He turned to the instructor, and with his hands clutching his chest, he said: "Lead poison."

I wonder if we, as instructors, ever realized the importance of this phase of the trades and occupations. When we discussed the trades, their advantages and dis-

OCCUPATIONAL DISEASES

Designation of Substance	Occupation or Industry	Effects
Ammonia.	Coating iron plate with zinc or tin—varnish and lacquer manufactures.	Bronchial catarrh. Inflammation of eyes. Inflammation of lungs.
Antimony Compounds.	Burnishing steel ware; manufacturers of alloys, type and stereotype metal, remelting old scrap iron.	Eruption of skin. Inflammation of mouth, throat and stomach. Intestinal colic. Weakness of the heart.
Brass.	Filing, cutting and polishing or casting of brass.	Intestinal catarrh. Lung trouble. Chronic bronchitis.
Arseniureted Hydrogen (Gas.)	Soldering and etching, enamelware manufacturer, tin, zinc and lead plating.	Same as Antimony compounds.
Bronze.	All trades where bronze is used either in liquid or powdered form.	Same as Brass.
Carbon Monoxide.	In plants where defective heating is used, iron and metal foundries, soldering, garages, drying plaster in new buildings.	Acute poisoning. Chronic convulsions. Palpitation of heart. Insomnia.
Cement.	Cement workers.	Asthma, chronic bronchitis, lung trouble.
Copper.	Coppersmiths, filers, bronzers, miners, smelters' foundries.	Same as Brass.
Emery.	Grinders.	Cutting respiratory tissues, ulcers. Tuberculosis.
Felt and Fur.	Furriers and hatmakers.	Tuberculosis.
Glass and Emery Dust.	Glass factories.	Tuberculosis, eczema, rheumatism.
Horsehair and Hair.	Upholstering.	Bronchitis, ulcers, asthma.
Iron and Steel.	All industries engaged in the handling of iron and steel, cutting and grinding works, etc.	Grinders' consumption. Ulceration of the eyes.
Lead.	Smelting of lead, manufacturers of lead colors, painting and varnishing.	Lead colic. Lead paralysis. Blindness, insomnia, high blood pressure. Lung trouble.
Metal Filing.	All workers in metal.	Tuberculosis, asthma. Chronic bronchitis. Lead poisoning.
Oxalic Acid.	Polishing of metal.	Weakness of heart. Convulsions.
Paraffine.	Electric wire insulating.	Cancer of skin. Eczema.
Stones and Earth.	Workers in stone, flint, granite, marble, brick.	Tuberculosis, asthma. Chronic bronchitis.
Turpentine.	Manufacturers of varnish, cement, lacquer, house painting decorator.	Catarrh. Bronchial inflammation.
Wood.	Furniture making, etc. Inhaling of dust, floor scrapings, sandpaper dust.	Skin trouble. Asthma, catarrh, nausea.
Zinc.	Plate workers, battery makers, brass foundries, zinc white paint manufacturer.	Same as Brass.

advantages with classes of future tradesmen, when we tried to portray the trade as it really is in the industrial world, did we spend much time on the human element side of it? I am afraid we did not, and it was the few remarks that the painter had made that set me thinking along that line.

There can be no question that occupations have a vital effect upon health. Some occupations are conducive to health, others are not. To follow some special trade does not mean that one must become diseased in some form, but that there is greater or less liability to this or that disease. You can handle dynamite without being blown up, yet there is always the element of risk connected with it, and so one may handle white lead without acquiring lead poisoning, yet there is always the possibility of the disease.

When diseases are spoken of as occupational or industrial, it is not meant that they are characteristic of those men employed in certain occupations, but simply that workers of certain occupations are more liable to become affected with this or that disease than those employed in certain other industries. It is essential, therefore, to instruct and familiarize the students with the hazards connected with certain occupations. Exaggerations should be avoided, yet on the other hand, the risks should not be under-estimated. Most of our occupational diseases or hazards are being eliminated by proper safe-guarding on the part of the employer as well as the employee, and we have statutes and regulations that require the utmost care in the equipping of plants and factories in regard to health and safety precaution. Modern plants are now equipped with means for eliminating many of the hazards that workers have had to face; yet like dynamite, there is always the element of risk to be considered.

When the effects of different occupational diseases are taken into consideration, along with the knowledge that physique, constitution, and temperament of different individuals make them especially liable to certain ills, one may judge whether or not it is advisable to engage in certain occupations. A trade which may be perfectly safe for one individual may not be for another. For instance saw grinders and painters are especially liable to become affected with lung trouble; therefore, when the lungs are naturally weak, these occupations should be avoided and some occupation selected which is not conducive to such diseases.

The United States Bureau of Labor at Washington has compiled a chart of the occupational diseases, and I have selected a number of the industries that are most common and in which a large number of our boys will possibly find employment. These are arranged in a form which may be helpful to instructors of shop subjects and related subjects as well, in their talks on the different trades and industries which in some way contain some of these diseases. It will also serve as a basis for additional study in shop safety and hygiene.

Something Different in Lamps

N. C. Tock, Wellsburg, W. Va.

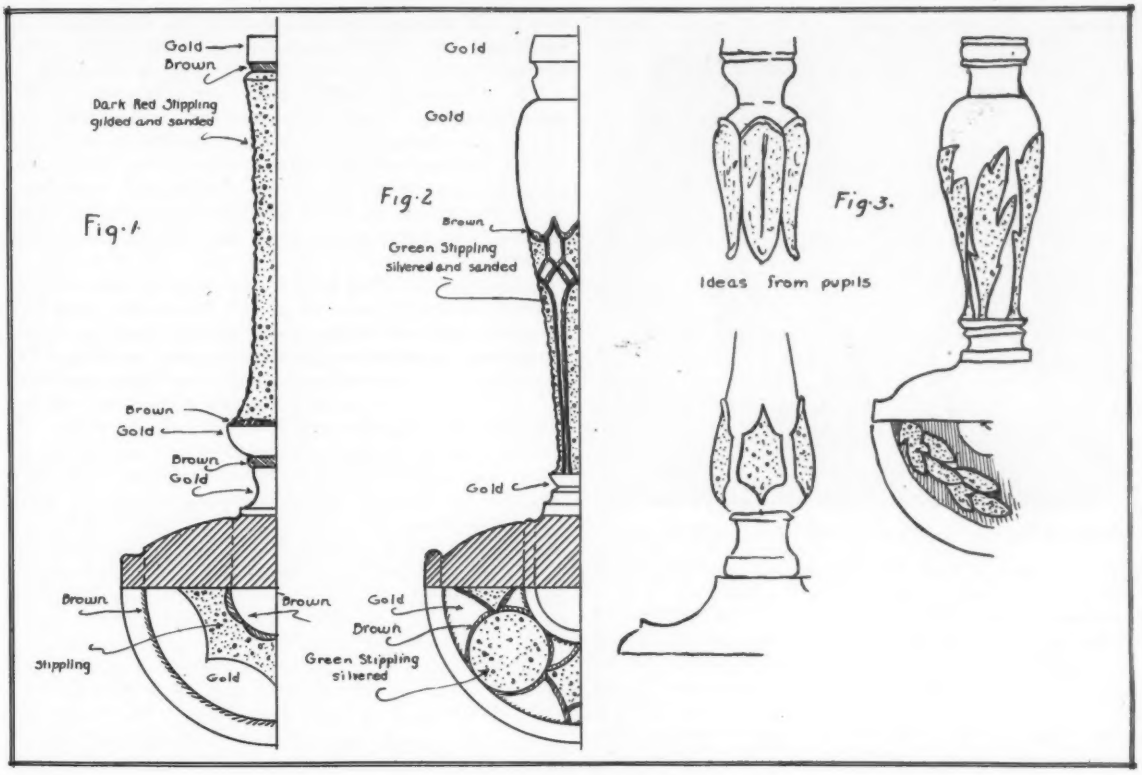
Our boys here are much interested in a method of decorating lamps and other small decorative objects, which is new to us, and no doubt will be new to others. This method is an adaptation of the commercial polychrome decoration, and is successful in a variety of treatments which will result in some pleasing and decorative projects. It furnishes a medium for artistic expression and for the use of originality in design, making its use practical and desirable in the shop program.

The General Idea. A pattern is drawn upon the lamp, the outline carved out with a narrow gouge, and some of the spaces thinly coated with a stippling mixture. The stippling material is left with a rough surface. After it sets, the entire lamp is gilded. Then after the gilt dries, the stippled surface is sanded so that the gilt is cut off the high spots, exposing the colored stippling beneath it, and leaving the rest of the surface in the gold. The result is a harmonious polychrome—many colored—surface. More detailed directions follow.

Layout and Design. A layout of the lamp and pattern should be prepared before beginning work. This layout may be somewhat like the drawings in Figs. 1 and 2. The shape of the lamp and the decoration depend on each other, as the drawing shows. Leave a thickness at the base, which will allow for a hole large enough to run the wire through. The base works out well when it is planned with a bead at the edge, a reverse curved surface, and another bead or cove at the junction with the post. This gives a good surface for applying a design. The post should join the base with a smooth flowing line. Since the designing of turned lamps and candlesticks has been discussed quite recently in THE INDUSTRIAL-ARTS MAGAZINE, I shall suggest only that the bases be kept free from numerous beads and coves. Provide a substantial seat for the socket, a graceful curve from neck to base, and neat accents to mark changes in the direction of the curves. This will give you a satisfactory shape for this type of lamp.

Turning and Preparing for Finish. Turn the lamp

LAMPS MADE BY THE AUTHOR'S STUDENTS.



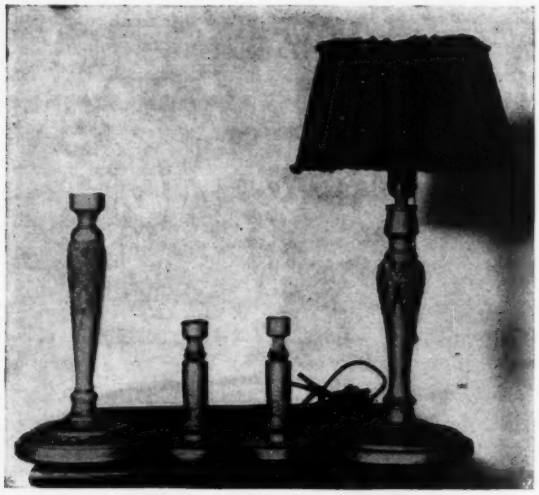
DETAILS OF LAMPS.

from white pine or other soft, close-grained wood. The preparation before turning will depend on the type of fixture to be used. We use a single socket screwed to a short piece of ⅛-inch gas pipe. The pipe is pushed into the hole bored through the post for the wire, and is glued into place. Some of the boys use an adapter which they purchased at the five-and ten-cent store. It has the disadvantage of putting the bulb too high up on the post. It fits into a ¾-inch hole bored into the top of the post before boring the hole for the wire. Some fixtures will fit the top of the post, being secured with screws. At any rate, any holes that will need to be bored, should be put in before turning. To make solid surfaces for the live and dead centers to bear on, plug the wire hole with a short piece of dowel at each end. The dowel is to be glued into place. After the lamp is turned the dowel can be bored out at the top by holding the tenon end of the post in the vise, and, while one boy holds the post steady, another boy can turn the brace. At the bottom it is better to so arrange matters that the plug can be cut off with the waste wood, because it is hard to hold the top end of the post in the vise to bore out the bottom, without scratching it. Give the lamp a thin coat of shellac before removing it from the lathe and sandpaper it smooth when it is dry. The purpose of this is to fill the grain a trifle and keep it from showing through the gilt later. Any cracks which appear, can be filled with the stippling dope and sanded smooth as soon as it sets.

Laying out the Pattern for the Decoration. The design for the base is next in order. The circumference of the base should be divided into equal parts with a compass, and radius lines from these points should be drawn through the center, dividing the base into equal segments. Seven, or eight, is a good number. Lay out a segment, full size, on a piece of paper and confine one repeat of your design within its boundary lines. Draw a center line through the pattern and use it as a guide in centering the pattern on the radius lines. The division of the post is a little more difficult. We usually space the divisions by placing the post in the base and marking the points where the radius lines touch the post. Then we center the post between the lathe centers, and with the tool rest as a guide, draw lines from bottom to top. Sometimes we line the divisions and draw the patterns freehand. At other times we use cut-out paper patterns.

Mixing the Dope. This material can be bought in commercial form, but we find it convenient to mix our own. For one lamp, the following will be sufficient: One tablespoonful of whiting, a little more than the same quantity of plaster of paris, coloring material, and enough shellac to make a paste. A putty knife and a sheet of glass are good mixing tools. For coloring, one can use burnt umber or any other color ground in oil, aniline dye, spirit stains, automobile enamel, and the like. The consistency may vary between wide limits. It may be thick enough to stand alone, for thick, bold designs, or it may be mixed thin for an all-over ripple finish for a larger surface. Another mixture for all-over surfaces is made of white lead, thinned with drier, and then thickened with plaster of paris. This does not dry as hard as the shellac mixture, and it should not be applied in as thick a coat, nor should it be sanded through.

Applying the Dope. The thin mixtures can be applied with a brush. Leave it with a rough surface, and it will settle down to a sort of ripple finish, which is excellent for large surfaces if left in the gold. Thicker mixtures can be applied with a knife. After the dope sets enough to hold its shape, go over the surface with a stiff brush, pulling the material up into little points. For a variation, the head of a nail can be used to cover the surface with small depressions. The dope can be made in two or more colors and applied in a mottled or spotted effect. In applying the dope, be sure to fill out to the edges of your pattern, leaving a definite ridge to



LAMPS DESIGNED AND MADE BY THE AUTHOR'S STUDENTS.

mark the boundary of the stippled area. Otherwise a smeary, wishy-washy looking job will result.

Cleaning Up. When the dope is hard, a narrow carving gouge can be used to cut out the lines inclosing the stippled areas, or to complete other portions of the design. This also helps to true up the edges of the plaster. If no carving is done, clean up the edges with a knife. See to it that the pattern looks clean and neat before gilding.

Gilding. We use bronzing powder which we get at a paint store. A small quantity of aluminum powder should be mixed with it to cut the raw color of the bronze. For a vehicle, the enamel or lacquer which comes with the powder works best. If it cannot be secured, varnish or shellac will do. Beginning at the top of the post, and using a soft camels-hair brush, swiftly put on a thick flowing coat of the gilt. Keep the edge running all the time. This will result in a smooth coat, while if you work slowly, the gilt furs up under the brush, much as shellac does, and gives unsatisfactory results. Of course, there is such a thing as too thick a coat. Use a little discretion. A sprayer is supposed to be the proper thing to use, but as we do not have one, we manage without it.

Finishing Up. After the gilt is dry, there are a number of things that can be done to further elaborate decoration.

1. If you used a thick mixture that hardened well, sandpaper the stippled surface and let the color show through.

2. If you cut grooves with a gouge, run a little color into them to make them stand out more clearly.

3. If you used the thin white lead mixture, or if you do not care to sand through the gilt, put a little color on a cloth, rub it over the rough portions, and wipe most of it off. This gives a sort of iridescent effect.

4. Color some of the beads or coves, to match the stippling.

Another variation, is to make the lamp out of some cabinet wood such as walnut, fill the grain carefully, stain, shellac, and apply medallions of stippling work. These may be gilded or stained to match the lamp. In the latter case they will look like composition carvings.

Last. Give the lamp a coat of good clear varnish after all other work is done.

The Accompanying Drawings. The lamp shown in Fig. 1 was finished in dark red, burnt umber, and gold. The post was covered with a thin mixture and left with a rippled surface. The gilt was applied and immediately wiped down with a cloth dipped in the gilding mixture. This wiped most of the gold off the high spots. When this coat had dried, the entire post was wiped over with the burnt umber, most of the color being wiped off again. This toned the gold down to a very pleasing old gold shade. Some portions were left in the brown as were also parts of the base. The stippled portion of the base was handled the same as that on the post. The lamp was fitted with a shade whose outside matched the general tan color of the lamp, and which was lined with light green silk.

The lamp shown above was finished in brown and green, and gold and silver. The stippling was green, the grooves brown, the main portion of the lamp gold, but with a second coat containing more silver, applied to the stippled part before sanding. The shade for this lamp is also in brown and green.

On bookends we have applied festoon designs of red and green mixed rather thin and left smooth. We expect to use it in decorating chest panels when a lack of time or skill on the part of the pupil make carving undesirable. We shall also try it out on table rails in place of the composition carvings sometimes used.

The freehand sketches show some of the designs handed in by pupils, and applied to their projects.

The Duties, Qualifications and Responsibilities of Directors of Vocational Education

S. Lewis Land, Lecturer, Department of Industrial Education, University of Wisconsin

II. THE DIRECTOR AS AN ORGANIZER

THE director of vocational education must be a good organizer. He has certain duties to perform, which have been termed "organization duties" and which may be classified under seven headings: (1) Organizing the course of study; (2) curriculum building and organizing new courses; (3) conducting surveys; (4) organizing materials for bulletins, pamphlets, and manuals; (5) organization of office; (6) organizing system of budgets; (7) installing new equipment.

1. Organizing the Course of Study

The director usually has the privilege of organizing his own course of study. Sometimes, however, he does not have the entire responsibility for this work. If the course of study has already been mapped out by the state department or the local superintendent, then he is still charged with the responsibility and has the opportunity of assisting in adapting or reorganizing the course to the community, and to the needs of students taught under his supervision.

Some attempts have been made to set up standards for courses of study. It is impossible to set up a criteria by which all courses of study are to be formed. Different localities demand different and various subject matter. The director should have a thorough knowledge of the needs of the students taught under his direction, and should have an adequate knowledge of the various kinds of subject matter that may best be adapted to these needs. He must have an understanding of the capacities and limitations of students and of the possibilities of their carrying on the work in the time allotted for it. The sub-

ject matter in all cases should approximate life as near as the school situation will permit. The director should at all times be open to suggestion from his teachers and from experts in the several courses involved.

When the community has no great industrial activities, but vocational schools are in existence, or are to be established, the director should consider the kinds of work for which there is the greatest demand in other communities, and which would be attractive to young people. It is not expected that young people will always remain in the towns in which they have been born, or that they will be satisfied to choose among the limited number of industries that are carried on in small cities. It is, therefore, necessary that the director shall know the kinds of work in which there is the greatest demand for labor in other communities, and which will be attractive to young people in his own community.

2. Curriculum-Building and Organizing New Courses

A good curriculum is ever a matter of growth and change. Curriculum-building is not a job that can be done and checked off the list. As a basis for curriculum-construction, the director should make a continuous survey of the needs of his community, a survey of the needs of local industry, and a study of the needs, capacities, and limitations of those who are to be trained.

Too often in the past we have used the "arm chair" procedure in curriculum-construction. But, school people have begun to see the fallacy of this method and today throughout the country—from Maine to California—committees are working on this problem of curriculum-construction work with a factual background.

From time to time the director will add new courses to the curriculum as the needs arise. He should at all times seek constructive criticism from teachers, superintendent, coordinators, and others who, because of their training and experience, are fitted to give helpful advice.

The director should have an organization, made up of committees of his teachers whose purpose it is to study problems of curriculum construction and the course of study.

3. Conducting Surveys

The traditional method is too often used in deciding important problems connected with curriculum construction and programs of work carried on in schools. The vocational director should be able to organize and conduct a survey to ascertain (1) the needs of industry, and (2) capacities, limitations, aptitudes, and desires of pupils. The problem of making a survey is sometimes a difficult one because very often the individuals with whom one comes in contact, are not in sympathy with it, or are very skeptical about it.

The survey of the industries should reveal such information as qualifications and training needed for various types of work, advantages and disadvantages, possibilities for promotion, wages received, hours of work, and number of workers needed. As a result of having such information, the real needs of the community may be determined and consequently, objectives may be established. The survey should also make clear the need for additional lines of vocational work which have not yet been recognized, by either the employer or the employee.

The director should have an organization, made up of development, organization, and administration to meet these needs. This determination should include a careful estimate of the expenditure that must be made for capital investment, in modification of existing available buildings, and of equipment necessary to carry on the work. The increase in operation and maintenance expenditures should also be determined.

The instructional and equipment needs of the schools should be determined, by collecting information from reliable sources relative to those needs. If the proposed further development involves the erection of new buildings or extensive modification of existing buildings, the estimates should be made by an architect, selected by the board of education for that purpose. It should, however, be the function of the director to present to the board and to the architect a definite statement of the additional room space needed to accommodate the proposed new or enlarged activities. He should be better prepared than the board to determine the necessary equipment and its cost, and should submit his estimate in detail, with the detailed statement of increased operation and maintenance expense.

The second part of the survey having to do with the capacities and limitations of pupils, can be conducted in the school system. If there is a department of vocational guidance in the school system, this problem will be largely the work of that department. The director, however, should lend his cooperation in carrying on the work.

The director should be sure that vocational work offered at any time is sufficient in scope and character to meet the needs of the individuals being trained, and adapted to the demands being made.

4. Organizing Materials for Bulletins, Pamphlets, and Manuals

The director should be a leader and as a leader should be able to make contributions in the form of magazine articles, or the preparation of bulletins, pamphlets, and manuals.

He may at times want to present in bulletin form conclusions drawn from a survey of the local industries. In a large school system where policies are well established, he may issue manuals to teachers, containing policies of the system, and outlines of courses and aims to be accomplished. He may acquaint industry, parents, and pupils with what the school offers, by issuing pamphlets containing information about the schools.

The director must appreciate the importance—to young people—of the opportunities offered by the vocations, and he must make it his business to see that this is put before not only these young people, but the people of the community. He must be prepared to show the value of this work not only to individuals but to the community as a whole. He must remember that the success of his work depends upon the support it has in the community, as evidenced by the money the community is ready to furnish for the development of vocational education. He must—through his writings—inform the people of what is being done in local schools, what is being done elsewhere, and of the local needs.

5. Organization of Office

As has been previously stated, the office of the director should be business-like and orderly. System, orderliness, and organization prevent waste of time and promote efficiency. Furthermore, if the director has the proper time—free from office duties—for his real work, he will need to thoroughly organize his office so that he can delegate certain routine work to assistants and clerks.

6. Organizing System of Budgets

In any adequate school organization there will be found a system of budgets. They are a necessity in a well organized institution. The officers of the school board, and the superintendent of schools will need to know in advance the amount necessary for carrying on the vocational education program. The director should know the amount of the appropriation for his work so that he can plan the year's work accordingly. The budget will include expenditures for salaries, equipments, supplies, and incidentals. The competent, experienced director can estimate fairly well the necessary expenditures for a year based on those four items.

7. Installing New Equipment

As was stated in the discussion on the course of study, the director should ever be ready to make needed changes in his curriculum and to make additions necessary because of changing needs. It will be necessary from time to time to replace old equipment with new. The director cannot rely upon information given him by manufacturers and equipment houses. Before purchasing, he should consult with the teacher in charge of the work, and with other individuals, who because of their training and experience, know what equipment can most economically be purchased for the greatest service.

III. PROBLEMS OF PROFESSIONAL RELATIONSHIPS

We now turn to a consideration of the relations which the director bears to other persons who are either directly concerned in the development of his work, or who are indirectly concerned and whose cooperation should be enlisted.

1. Cooperation with Superintendent, Principals, Special Teachers, Regular Teachers, Pupils, Patrons, and Board of Education

a. Relation to the Superintendent

So far as the special work is concerned in some communities, the director is responsible to a vocational board, and has no administrative relationship to the superintendent of schools. This is the form of organization which is found in the state of Wisconsin, in all cities of over five thousand population.

In a larger number of communities, there is no special vocational board and the vocational work is under the same control as the other school work. In this type of organization the director should be an official representative of the superintendent. In another sense he is an adviser to the superintendent. He should keep the superintendent informed as to the progress, needs, and development of his work. He should be thoroughly acquainted with the policy of the superintendent and interpret that policy to the teachers. He should be a loyal supporter seeking in every way to further the interests of the administration.

In any case whatever the administrative relationships, there should be close cooperation between the superintendent of schools and director of vocational education.

b. Relation to the Principal

The relation of the director to the principal will also depend upon the method of administrative control. In some communities there is no administrative relationship. In communities where both vocational education and general education are under the control of one board, the principal should be responsible for everything that goes on in his building, and the director should be considered an expert in vocational education. The principal should feel free, and be encouraged, to call upon the director for assistance in any problems that arise in connection with the program of vocational education.

c. Relation to Special Teacher

To the special teacher, the director is guide, friend, counsellor and helper. His direction should be accompanied by a courteous, helpful, and sympathetic attitude —not dictatorial.

d. Relation to Regular Teacher

Here again the method of control will influence the relationship. In communities in Wisconsin, where separate boards are found administering the work, there is practically no relationship between the director and the regular teachers in the general education field. Of course to all teachers of vocational or related work, the same relationship should exist as has been indicated above in his relation to the special teacher.

e. Relation to Student

"The relation of the director to the pupil is that of student as much as teacher. Teacher indeed he must always be, and one with manner so attractive and friendly that he may be able to win immediate success with strange classes. But more than teacher he should look to the classroom as the proving ground for his theories, the place where experiments and proposed changes in the course of study may be tested in the light of the child's attitude".[1]

f. Relation to Patrons

To patrons and parents the director must also be teacher. His primary function is to further knowledge of his work, and to do this he must see to it that parents are advised as to the meaning and purpose of his work.

g. Relation to the Board of Education

In Wisconsin the director is directly responsible to a local board of industrial education. In most other communities the director is usually responsible to the board of education in an indirect way only. He is usually responsible to the superintendent of schools, and the superintendent is responsible to the board of education.

2. Cooperation with Manufacturing and Industrial Organizations

The director should enlist the cooperation of manufacturing and industrial organizations and of manufacturers and employers. More and more we are coming to realize that in order to insure best results, the instruction given in the classrooms and shops must be supplemented by practical instruction and training on the job. Through a cooperative arrangement with local manufacturers and employers, it is possible to organize a part-time cooperative scheme of training that will be most helpful. The work of Dean Snyder of the University of Cincinnati, which has been modified and adapted to the vocational work in many communities, is a notable example of this type of training.

There are many other ways in which cooperation may be of great advantage. The manufacturer may be invited to the school—the teacher with students may visit the shops, factories, and manufacturing establishments. Through such cooperation, the schools receive the friendly aid and criticism of the manufacturer and the service rendered by the school becomes known to those who are in position to employ its graduates. These results are worth-while.

3. Cooperation with Business and Social Organizations

Closely associated with the aid that may result from contact with manufacturers is the aid that may be received from business and social organizations. Whenever the director finds opportunity he should become a member of some such organization as the Rotary, Kiwanis, or Lions' clubs. Such relationships give him an opportunity for social growth and broadens him in many respects.

4. Talks Before Civic Clubs and other Organizations

Civic clubs are always desirous of securing good speakers. The director should grasp every opportunity presented to go before such clubs for the purpose of making known the work he is trying to do. This is one of the best means of educating the public, and of getting the cooperation of influential men. He can well afford to spend a considerable amount of time in preparing talks and addresses for various occasions.

The director should be able to express himself clearly, accurately, and convincingly on any of the problems of vocational education, not only to his fellow directors and teachers, but to the people of his community and especially to the leaders in the industries.

5. Social Welfare Activities

The director should be an active community worker. He should identify himself as one interested in the social welfare of the community. He owes this service not only to his community but to himself, "for the good of his soul."

[1] Haney, J. P.—Year Book, Council of Supervisors of Manual Arts. 1903, p. 19.

6. Self-Improvement

Not least of all the professional relationships of the director is his relation to himself. His education is never completed. He should be a broad reader, and through reading professional magazines and current literature keep himself in close contact with new developments in his work. He should attend his sectional and state educational meetings, and if possible attend at least one national meeting each year.

Then there are many other opportunities for self improvement. Many of our universities and other teacher-training institutions offer excellent correspondence courses. Many directors also take advantage of the excellent opportunities afforded by summer schools.

The successful, alert, progressive director will ever be finding means for self-improvement, and through self-improvement will come improvement of those he directs, and better results for the pupil. (To be Continued.)

Cooling the Automobile Engine

Ray F. Kuns, Cincinnati, Ohio

Need of Cooling. When it is fully realized that there is a clean blue flame licking every part of the combustion space with each explosion of a fuel charge within it, it will be appreciated that cooling of the automobile engine is essential. The heat from the fire within the cylinders of the engine must be carried away and allowed to escape into the air. Air is the only thing which is present in large enough quantities to continually cool the running engine. In the final analysis the cooling of all automobile engines is air cooling. Where combustion engines are stationary and quantities of water are present, the motors are water cooled and little thought, if any is given to the temperature of the surrounding air. Motor cars traveling through the air are designed to dissipate the heat from the engine into the air through which they pass. They accomplish this by direct air cooling or by means of water which serves to conduct the heat from the engine and then is allowed to give off the heat into the atmosphere surrounding the car or passing through the radiator. If a car is operated for any short periods, without the cooling system in operation, the engine overheats. Constant cooling is absolutely essential to constant running.

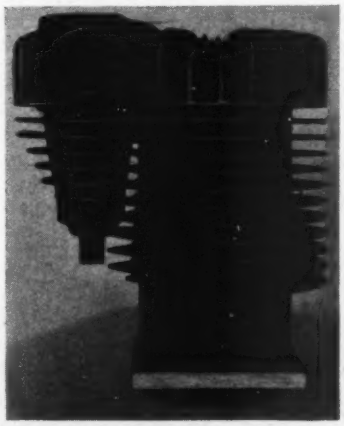


FIG. 1. SINGLE CYLINDER WITH COOLING FLANGES CAST INTEGRAL WITH CYLINDER.

Motorcycle Cooling. Practically all motorcycle engines are air-cooled directly. Fig. 1 shows a cylinder with the cooling fins cast directly onto the cylinder metal. Heat from the burning fuel passes into the cylinder walls, flows from that point into the fins, and from the fins is taken up by the air surrounding the engine or rushing past it as the car is driven forward. It is common knowledge that it is not safe to operate a standing motorcycle for any great length of time. No fan is provided to drive the air past the engine. The engine overheats under these conditions.

Airplane Engines. Considerable success has attended the designers in attempting to air-cool rotary airplane

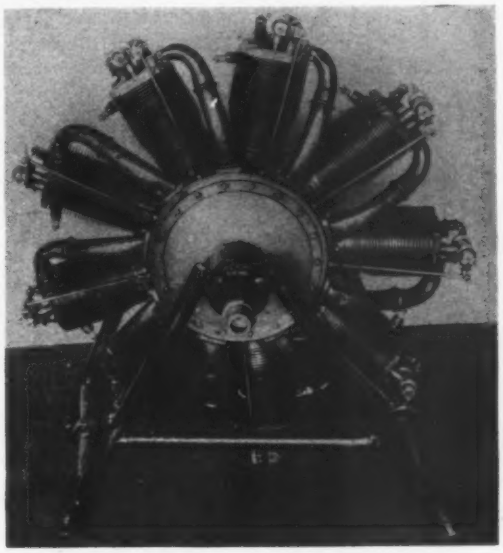


FIG. 2. NINE CYLINDER, 80 H. P., ROTARY AIR COOLED AIRPLANE ENGINE. FLANGES ARE MACHINED FROM SOLID STEEL BILLETS.

engines. These engines are designed to rotate about a stationary crank shaft. The cylinders, of the LeRhone engine, nine in number, are made from steel. The cooling flanges are turned from the solid metal. The fins or flanges cut through the air at great speed since they are turning, while at the same time the plane carries them forward as the propeller drives it. Lightness of the finished job is a feature of all air-cooled motors whether applied to a motorcycle, an airplane, or a motor car. The rotary motor, shown in Fig. 2, weighs only a fraction over two pounds per horse power. It rates around eighty horsepower.

Air-Cooled Motor Car Engines. Direct air cooling of the motor car engine is best represented by Franklin practice. Its success is as old as the industry. Improvements in design have brought it to the point where the cooling is very efficient. A blower, carried at the front of the engine, forces the air up over the cylinders into an enclosed space. From that point it is forced down past the cylinders and the valve ports and other parts, which it cools as it passes. No heavy block castings are used, but manifolds and cylinders are arranged individually so that the cooling air may have much surface to cover and thus draw off the heat. There are about fifty steel flanges cast into the cylinder walls in a manner which makes them good conductors of heat. The cylinders are arranged with jackets so that the air must pass along these flanges or fins. Great quantities of air are forced through the engine. The heat from the burning fuel is

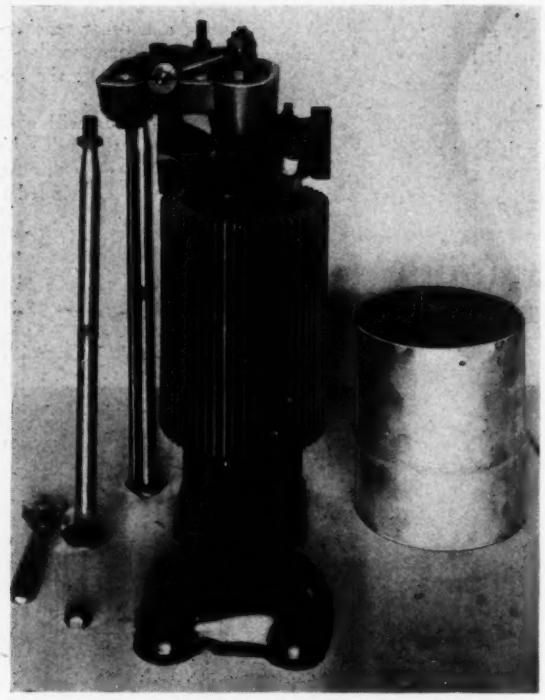


FIG. 3. AUTOMOBILE CYLINDER. STEEL FINS ARE CAST INTO CYLINDER CASTING.

taken up by the cast iron and steel flanges, and is given off directly into the cooling air. Fig. 3 shows a cylinder with the sheet metal jacket aside of it, and Fig. 4 shows the jacket in position. Air after leaving the engine is passed back through the engine compartment and then out under the chassis, much in the same manner as the water cooled cars.

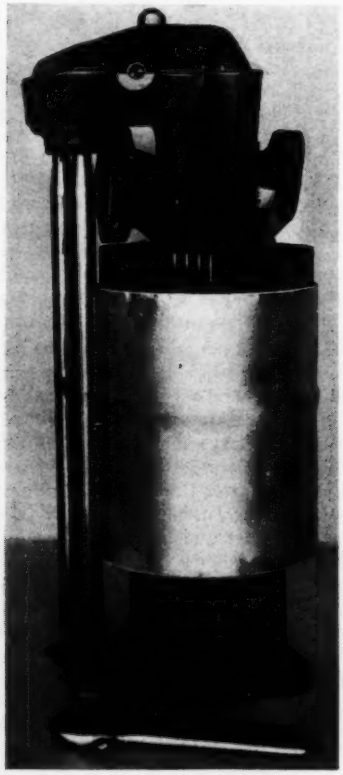


FIG. 4.
A sheet metal jacket is used to cover and confine the air currents to the cooling fins.

Water Cooling. Cooling the engine with water means the water is used to conduct the heat from the hot engine castings. The heated water is taken to the radiator, where it is allowed to flow through the tubes or cells of the radiator, and the heat is extracted from it by the air which is forced past the thin walls of the radiator passages. Spreading the hot water throughout the radiator allows great quantities of air to come into almost direct contact with it. The radiator cells and tube walls are paper thin. Heat passes through them readily. The rushing air takes the heat with it. Fins are used in the radiator to give additional cooling space or radiation surface. Fans are used to drive the air through the radiator when the car is standing or traveling at low speeds. At high speeds, the fan is less essential, since the car rushing through the air sets up a flow of air which is about as rapid as the fan could give. It is claimed that racing cars travel faster than the fans could force the air and that a fan would obstruct cooling. Radiator cores are illustrated in Fig. 5.

Round Tube Radiator. The type of radiator with the round tubes running from an upper to a lower tank, is used a great deal. The tubes are set very closely together, usually in rows from the front to the back and from side to side of the radiator. Fins are stamped from thin copper or brass. Each fin has provision for all the tubes to pass through it. When the job is completed it is hard to see the tubes because of the surrounding fins. The tubes and fins are sweated together with solder to insure the quick passage of the heat from the water to the tube and then into the fins, where the air will relieve them of it. One objection to the tubular radiator formed from the round tubes is the fact that the flow of the water is not greatly retarded. The travel of the water is no farther than from the top of the radiator to the bottom. It is possible that the water may pass through the radiator before the heat is reduced as much as might occur in some of the other types of radiators. If this should happen, the water entering the engine may be too near the temperature of that leaving it. Generally speaking, however, cooling depends on the amount of cooling surface within the radiator. Radiators are designed to care for the average needs of the cars they are fitted to, and

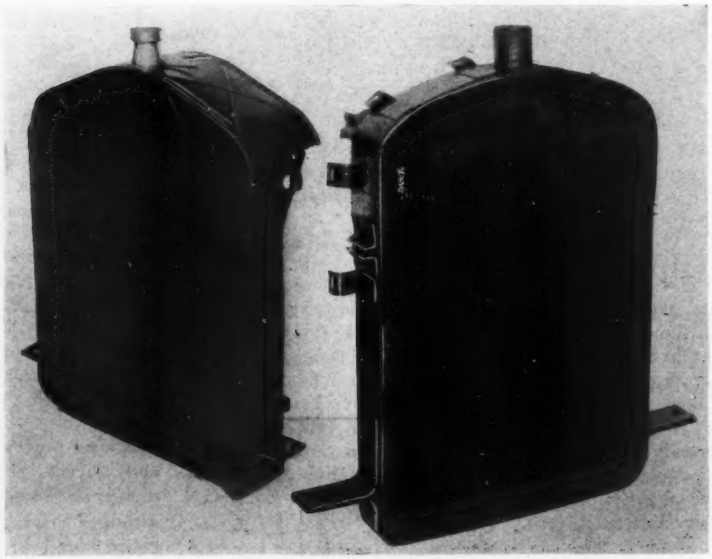


FIG. 5. RADIATOR CORES. LEFT, ROUND TUBE. RIGHT, HEXAGONAL HONEYCOMB.

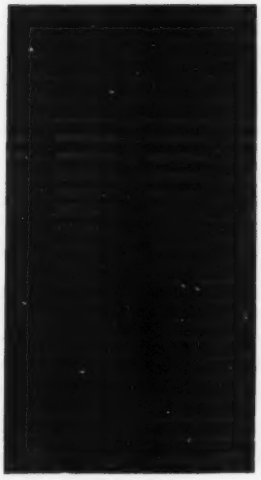


FIG. 6 (Left).

Section of round tube radiator core. Tubes are vertical and the cooling fins horizontal.

FIG. 7 (Left).

Section of the flat tube radiator.

FIG. 8 (Right).

Section of the core of the square cell honeycomb radiator.

overheating is seldom encountered as a result of small radiators, or because a radiator is of this or that type. Note Fig. 6. All radiators are provided with overflow tubes to allow for expansion.

Flat and Irregular Shape Tube Radiators. Many radiators have the appearance of a lot of cells laid together; from their appearance they are spoken of as honeycomb radiators. See Fig. 7. Many of these are made from tubes which are rather on the order of two flat pieces of sheet metal laid rather close together and having a narrow passageway for water between them. These flat tubes vary in width. They seldom run straight from tank to tank on the radiator but are bent in such form that they will have two or three times the length which might be needed to reach in a straight line from the top tank to the bottom. This bending and forming has the effect of retarding the water in its passage through the tubes as well as presenting more surface to the water and more surface to the cooling air.

It is desired that the water entering the engine be cool enough that when it leaves the engine at the top of the cylinders it will still be slightly under the boiling point. It is possible to pass water down through a radiator so quickly that little cooling results and the water does not have an opportunity to take on a very great amount of heat while in the engine, without the danger of boiling. Where thermo-siphon cooling is used, the pipes are large, but in pump cooling the pipes leading to the engine and pump are sometimes made very small. Holding the water in the radiator longer sends it into the engine ready for a real load of heat. Designing a cooling system so that it functions properly under all conditions, keeping the engine neither too hot nor too cool, is a fine feat.

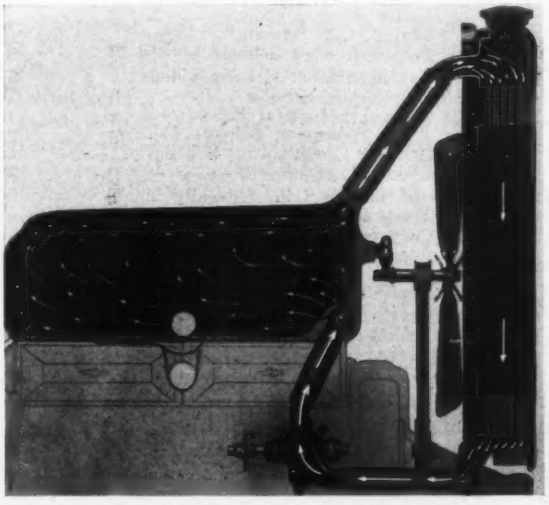


FIG. 9. FORCED CIRCULATION. NOTE ARROWS INDICATING DIRECTION OF FLOW OF WATER.

Honeycomb Radiators. A honeycomb radiator is made from a number of cells which are laid up one on the other and having the ends soldered together. Air flows through these cells from the front of the radiator to the rear. Water comes from the top tank or reservoir of the radiator and flows around the tubes so that each tube is completely surrounded by a film of water. This film of water is giving off its heat through the thin walls of the tube, into the air flowing through the tube. A honeycomb radiator is actually a stack of tubes about three inches long. Refer to Fig. 8. Layer after layer of these tubes is built up until the core is the desired heighth. The first row and the last row of tubes are joined to the water tanks. Just enough room is left between the tubes to allow the water to pass in a thin film or sheet. The tubes or cells may be laid up in a manner which prevents the passage ways for the water from being straight. Tubes are usually hexagonal or square.

Forced Circulation. Pumps are used by many motor car manufacturers to force the water through the engine and draw it down through the radiator core. The pumps are driven from the fan belt, or from the engine time gears, or from chains in the time gear case. The pump shaft in the latter instance usually has some of the engine accessories to turn, and for this reason extends through the pump. The engine equipped with forced circulation will not warm up as quickly when starting from a cold point as will the thermo siphon job. During the winter months the forced circulation job is less likely to freeze when driving. It may freeze while standing just as readily, and a frozen pump means more parts subject to damage. In some instances the long warming up period in forced circulation has been cut down by adding a thermostat to the cooling system. With some arrangements, the thermostat is included in the pump design. In other systems, the thermostat is built into the water lines from the radiator to the engine, at the top of the engine. It is immaterial where the thermostat is placed. It serves the purpose of cutting off the water in the radiator until such time as the water within

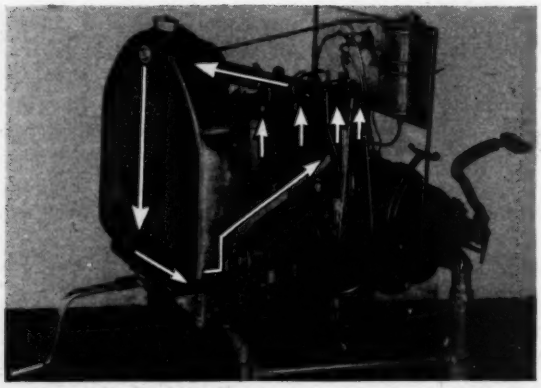


FIG. 10. THERMO-SIPHON COOLING SYSTEM. ARROWS INDICATE THE DIRECTION OF WATER FLOW.

the engine and pump is brought up to a satisfactory temperature for engine operation, usually about 170° to 180° F. When the small amount of water held in the engine jackets has been warmed up to this heat, the thermostat will open gradually and the water within the radiator will be added in a gradual manner until all the water has been brought up to about the same temperature. When the water is bypassed of course there is no cooling of it since it does not pass through the radiator. This allows the engine to come up to a satisfactory operating temperature in a very short time. In winter operation this is very desirable to prevent crank case dilution. Fig. 9 illustrates the flow of water through a forced circulation system.

Thermo Siphon Circulation. When water is heated, circulation will start or be set up. This is due to the fact that hot water expands and thus becomes lighter than cold water. Heat is applied, as a rule to the bottom of a vessel. The water first to receive heat expands and becoming lighter than that above it, rises. The water above being cooler, settles and thus, coming into contact with the bottom of the vessel, it receives heat and is thus set in motion. It travels up to displace some of the water at the top, and that displaced settles to receive more heat. While being heated the water travels round and round within the vessel. Engineers have designed cooling systems which take advantage of the natural law of water circulation. This is called the thermo-siphon system. Literally, it means to siphon or draw the heat out of the engine. Water heated by the engine rises within it and flows to the top of the radiator. Being cooled there, it starts to settle and, when it has reached the bottom of the radiator, it is relatively cool. This cool water flows through a large tube into the bottom of the engine water jacket and again is heated and started on its round. The water in an engine using this system circulates rather fast. It does not have the force back of it which the pump circulation system has and for that reason larger hose connections and passageways are provided for it. Thus, about the same amount of water will be circulated. The tanks on the radiator for thermo-siphon cooling are made larger than on the radiators for forced circulation. Fig. 10 illustrates the flow of water in a thermo siphon system.

(To Be Continued)

Printing as an Educational Factor in Many Types of Schools

C. W. Hague, The Stout Institute, Menomonie, Wis.

IF the many industrial subjects which have been tried in schools, printing leads all as a cultural-manual subject and can probably be formulated to serve more branches of work than any of the other so-called industrial courses. It is unrivaled as a vocational subject, it is helpful as a background for practically all commercial and graphic arts courses, and it is an excellent medium for general educational development. For these reasons we may expect to find printing in a larger range of schools, and as its flexibility of purpose and its real educational value are more fully realized, we may find it among the basic subjects of nearly every curriculum.

It is interesting at this time to note the progress which printing is making in the various schools, together with the purposes to which it is put. Of course printing is printing, and while it remains pretty much the same in nature, the content may be selected to fit a given purpose; the purpose of the particular type of institution in which it is serving. If it is to serve as a general shop course for the purpose of teaching manipulative skill, the emphasis will be placed upon mechanical operations. If it is to serve as a cultural subject, the aim will be to teach in practical form the application of the many related subjects, such as English, design, mathematics, and science. If it is a prerequisite or supplementary course in connection with other professional courses, the emphasis must be placed upon the relationship of what is being taught, to these subjects. When it is being offered as a course of teacher training, not only is the shop work important but a study must be made of the selection of content, organization, and presentation of material. We have, then, in printing an unusual type of content; one which may be adjusted to meet the needs of many objectives.

Let us now turn briefly to the various types of schools in which printing is already playing an important role so that we may understand the purposes to which printing may be put. For convenience they may be grouped under the following classification:

I. Public Schools
   1. Junior High Schools
   2. Senior High Schools
   3. Technical High Schools

II. Vocational Schools (Federally aided)
   1. Unit Trade Schools
   2. General Industrial Schools
   3. Trade Extension Schools
   4. General Continuation Schools
   5. Evening Schools

III. Vocational Schools (Not federally aided)
   1. Trade Schools
   2. Corporation Schools
   3. Special Industrial Schools (rehabilitation, deaf, dumb, blind, reformatories)

IV. Schools of College Grade
   1. Teacher Training Institutions
   2. Technical Schools
   3. Universities.

In the public school system probably the junior high school is the first place in which printing may be taught to good advantage. Consisting as it does of the seventh, eighth, and ninth grades, the pupils are of the age where they can master simple manual operations and they will derive much benefit, provided too much emphasis is not placed upon the vocational phase of the work. The course should be of a "try-out" nature, in which the pupils be-

come acquainted with the various operations for the purpose of helping them select their future vocations. No attempt is made to produce tradesmen at this time, but it may be that some will later enter the trade as a result of contact with the work taught here. The pupils are too young to be entrusted with difficult work or complicated machinery, and close supervision is necessary on the part of the instructor. It is an ideal opportunity to include a large amount of related work, such as English and grammar in connection with hand composition, and mathematics of paper figuring, cutting and estimating. It is also well to take the time to make a study of the history of printing, its evolutionary developments, and the importance of the present day printing industry in its many phases. In this way, the learner will become better acquainted with printing in the broader sense, and will be able to judge whether or not it is the work in which he will be most interested. A limited equipment is sufficient in the junior high school and the objective should be the development of the pupil rather than the production of work.

A student in the senior high school may or may not have decided what kind of work he will pursue for a livelihood. If he has not definitely decided, he is probably still in the "try-out" stage of life. If he has decided to continue study for later entering professional work in a university, he will undoubtedly be shaping his high school work as a pre-requisite. The printing course in the senior high school, should for this reason, be planned with a view for such professional subjects as journalism, advertising, or business administration. The shop may be broader in nature than in the junior high school and the pupil is capable of more difficult trade operations. Emphasis should be placed upon the relationship between the printing industry and the allied trades and professions. The publication of a school paper is a very desirable project in a senior high school, because it offers many practical problems closely related to both journalism and advertising. It may even be to advantage to correlate the English and commercial departments with the printing department in producing a newspaper or school annual for the purpose of more thorough training. Production work should be done as soon as the student is prepared for it, but the selection of the work should in all cases meet the needs of instruction.

The technical high school offers an opportunity for more concentrated work along trade and professional lines. It is assumed here that the students are industrially inclined and are taking the work for the purpose of fitting themselves either for technically administrative positions, or for later continuing the work in some higher institution of learning. The equipment should be as extensive as possible so that the learner may become acquainted with the broad scope of the industry. Emphasis should be placed upon organized instruction of systematic production. Modern printing methods and developments may be studied and applied for the purpose of instigating an evolutionary trend of mind. While the emphasis is placed upon technical work in this type of school, it must be remembered that the mind also needs academic training at this stage and this work must not be slighted. Much related work may be incorporated in the shop outline and taught in conjunction with the shop work.

In the discussion of vocational schools we will first consider those schools which are federally aided by what is commonly known as the Smith-Hughes law. These schools must meet with certain definite requirements which, to some extent, affect the nature of the work and its purpose. Both full-time and part-time schools are maintained under this head, and even these are of several distinctly different types. One shop, adequately equipped, may be used for these various types of classes, and in many cases one instructor is called upon to teach all groups of students. If this is the case, the instructor must be able to adapt his method of instruction and his teaching content to the several purposes in order to effectively put over his work. Practical trade experience should form a part of the preparation of the instructor so that he may have a practical point of view and so that he may create a shop-like atmosphere in his classes.

In the unit-trade school the purpose is to fit for useful employment persons over the age of 14, who have not previously entered industry. At least one-half of the time must be spent in practical work and the remainder in educational related subjects. The instruction is largely that of an individual problem because the boys may enter at any time and one class may represent many stages of development. The shop course, however, should be so arranged that the learners follow through an organized procedure of trade operations, and shop-like conditions should be created. This type of school is found in large cities and specialized workers such as compositors, pressmen, etc., may be trained. If this is the case, at least the early period of training should include all of the major occupations of printing so that the worker will understand the relationship of his work to that of his coworkers. Modern and extensive equipment is necessary so that the student may become familiar with all phases of the work for which he may be employed in the shop.

The purpose of the general continuation school is very similar to that of the unit-trade school, excepting that it is more general in nature and specialized occupations within a trade are not separated. It is found in smaller cities and boys in the allied trades such as bookbinding, engraving, and electrotyping may be found in the same group with boys learning composition and presswork. The demands of the local printing establishments are taken into consideration in framing the course of instruction, and in equipping these shops so that the training offered will fit the learners to meet the needs of local conditions. While the chief aim here is to produce tradesmen the instructor must not lose sight of the fact that only the proper development of the individual will insure his success. The most efficient manipulative methods should be taught and high standards of workmanship encouraged. Related academic training must accompany the course in shop instruction.

In the part-time trade extension classes, we find students who are already employed in the printing trade and who are attending school for the purpose of supplementing the knowledge obtained in the shop. They can take only such courses as are directly related to the printing industry, and preferably such phases of the work as they are not receiving in the shop. The instructor must have his course so organized as to be able to place the student at jobs which will most benefit him for advancement in the industry and at the same time not deviate from the sequential order of trade procedure. It is necessary for the instructor to know what the boy is doing in the shop so that he may fit his selection of work around the shop training. The more artistic phases and finer senses of workmanship may be stressed in the school so that the learner will produce a higher quality of work in the shop.

The part-time trade preparatory schools are established for the purpose of fitting persons over 14 years of age for employment in trades or industry other than the one in which they are at present employed. This means that the boys attending the printing courses may be employed in work which has no relationship to printing, but

that they are taking this trade preparatory work with a view of later entering the printing industry. The course of instruction here must be broad in nature so that when the boy enters the trade he will be fitted for useful service. This work seldom coincides with the trade extension classes, but should later be followed with trade extension work when the learner is located at the trade.

The part-time general continuation school is designed for instruction which will enlarge upon the civic and vocational intelligence of workers over the age of 14. A mixed group from various occupations may be grouped together in one class, where they will be given an opportunity to learn the nature and scope of the printing trade. No specialized trade work is attempted but rather it should serve as a "try-out" course for the purpose of helping the learner find out what work he would like to pursue. A limited equipment is sufficient for this work and typical trade operations may be included, acquainting the student of the nature of the industry.

The evening school offers opportunity for workers to supplement the work of their regular day employment. A person working in a print shop during the day may not have an opportunity to learn certain phases of the industry for which he is not employed, and the evening school should supply him with this knowledge. Here, again, the course of instruction must be so organized that he may be placed at individual problems which will be most helpful, and yet follow the order of trade sequence. The instructor must have had trade experience so that he will be informed on practical trade operations, and will be able to guide in the proper training of the individual. Modern and extensive equipment is necessary in order to comply with the requirements of the local printing industry.

Vocational schools not federally aided function as centers of trade, or industrial instruction, with independent control and requirements. Their policies are formed according to the needs and purposes of the particular schools and it will be necessary to treat them generally.

Numerous trade schools are operated throughout the country, controlled either by individuals or corporations, which are intended to train boys to be skilled workmen in the printing trades. The day is fast disappearing when boys go into the print shops to learn the printing trade from the bottom. This is due largely to the fact that unskilled labor offers a larger ready return in the way of salary. Industry has, therefore, found itself handicapped with a lack of skilled workmen and has turned to the trade school for producing the required employees.

The trade school, if properly and adequately conducted, is a great advantage over the old shop-apprenticeship-method because the learner obtains his knowledge in systematic order, under the supervision of instructors whose main business it is to train them in every phase of the work. The period of instruction is concentrated and takes much less time than the old shop method, but the disadvantage is that the boy is seldom paid while he is learning, and often has to pay for the instruction which he receives.

In a school of this type the complete trade is usually attempted and the emphasis is placed upon manipulative trade operations and processes. The equipment is extensive and modern and the aim is to simulate actual trade conditions and methods of production. If academic work is offered at all, it is in the form of closely related and applied courses. The United Typothetae School of Printing at Indianapolis is a good example of a typical trade school.

The corporation schools are, in many respects, similar to the trade schools, and their purpose is the same excepting that they are operated by an individual establishment for the purpose of training skilled workmen for its own employment. In other words, they feed themselves with skilled workers by a privately controlled school in connection with the shop.

In some instances the period of training in the corporation schools covers several years, in which the first period is devoted to full-time school attendance under the supervision of full-time instructors. The second period is part-time school and part-time industrial training, in which the learner comes in contact with productive work under practical conditions. The third period is spent entirely in the shop in specialized work under the supervision of a shop foreman. At the end of the third period, the boy is usually rated as a journeyman printer and is given full-time employment on a regular salary scale. A typical corporation school is operated in connection with R. R. Donnelly & Sons, Lakeside Press, in Chicago.

By special industrial schools is meant such schools as rehabilitation schools, schools for deaf, dumb and blind, and reformatories. Printing is particularly valuable in schools of these types and the purpose is usually to direct the unfortunate persons toward a worthy occupation. The scope of training will naturally vary depending upon the ability of the learners and the nature of the institution. In some cases a very adequate equipment and an extensive period of training is maintained, while in others only parts of the trade are in operation. Usually a generous amount of time is given to related academic work in these schools for the purpose of supplying cultural development along with the trade training.

Schools classed as schools of college grade are those in which the learners are doing work in advance of regular high school credit. The work is generally of a professional nature in which printing may be directly or indirectly the aim.

In teacher-training institutions the purpose is to train instructors of printing either as specialists, or in combination with other industrial subjects. The work is divided between trade training and professional training and may cover a period of several years. The Stout Institute is such a teacher-training institution, in which a two-year diploma course and a four-year degree course are offered. Teachers are trained to teach in both public and vocational schools and in numerous instances they have entered special fields of service.

The equipment in a school of this type should be governed by the demands made upon the teachers when ready to enter the profession, and the scope of work must be ample to fully prepare the teachers for their work. Emphasis is placed upon most efficient trade operations and the "why" they are done, as well as the best methods of presentation.

In the technical schools of college grade, the purpose is usually to train men for administrative positions in the industry or commercial positions in connection with the printing industry. The shop work here is largely basic to administrative training, or in the form of research for the development of modern trade processes. The equipment may be as extensive as is necessary to accomplish the purpose of the work, and the courses are designed for rapid progress rather than routine procedure.

Many universities are installing printing departments both for the purpose of teacher-training in industrial arts, and also in conjunction with the journalistic and advertising schools. It is essential that journalism and advertising be supplemented with a knowledge of printing because the press is the outlet for both. A general knowledge of the trade is necessary for a basic understanding in preparing copy and in type selection, and it tends to create the tradesman's point of view in production. The

course may be brief, with emphasis upon tangible operations. Large expenditures for equipment are not necessary where first-hand observations may be made in publishing plants.

This, in brief, includes the common types of schools in which printing may be adopted to advantage. With the growth of our vocational and educational institutions printing will grow, and with the development of printing the scope and advantages will increase many-fold as an educational medium.

Gilding and Compo Work for Children and Adults

C. A. Kunou, Los Angeles, Calif.

The organization of instruction in gilding, compo and polychrome work is a new feature of the Manual Education Department in the Los Angeles city schools. So far as the author knows, it is not in operation anywhere else in the elementary schools at present. This work is practical and of educational value. Following is a brief historical description of this work:

The art of gilding is one of the oldest and noblest of decorative arts in both ancient and modern times. The process of gilding, which is the overlaying of objects with leaf or powder gold affixed to the surface by means of a mordant, varnish or size, is first mentioned in Exodus and recurs in many chapters throughout the Bible. The Egyptians have developed the art of gilding in many ways, over thirty centuries ago as shown by the things found in recently excavated tombs.

It was the use of gilding on an enormous scale in buildings, ships, vehicles, furniture, and other objects

SAMPLES OF STUDENTS' WORK, MOSTLY JARS, VASES AND BASKETS. THE OBJECTS SHOW ORNAMENTS OF COMPO, ATTACHED, GILDED AND GLAZED BY THE ADULTS' CLASS.

that gave splendor to the ancient oriental peoples' civilizations.

History and archaeology show that when great nations have reached a high point of culture and power, this state is expressed in their arts. Splendor is obtained by the use of the most precious medium known to man—that is gold. This was true of the Hebrews, Assyrians, Babylonians, Egyptians, and other ancient peoples. It is becoming true of the people of the United States, which nation is fast approaching a point unequalled in culture and power, hence the appearance and final dominance of *aurous* and brilliant polychromatic elements in its industrial and school arts.

In modern times gilding is done in several ways; by hand and by electrolysis and other electro-chemical processes. There is an awakening in industrial and educational fields to lay hold of the secrets of those processes which endure for the comfort, admiration, happiness and progress of man.

Work with, and in gold symbolizes the highest, because it is the most precious and beautiful of all metals. It is the zenith in the progress of manual education work.

The work consists of the designing, constructing and gilding various types of objects of art and use, such as torcheres, lanterns, candle-holders, sconces, and other lighting fixtures; picture frames, book-ends, etc. It also includes the making of compo ornaments for decorating

PARTIAL EXHIBIT OF WORK DONE BY NEIGHBORHOOD ADULTS' CLASS.

and gilding terra cotta jars and vases, and also the gilding and polychromatically finishing of reed baskets.

The immediate value to the school and homes, in the making of useful objects of art is, of course, evident. The fostering of home industry by which art can be cultivated avocationally and also for commercial opportunities, and by which things of marketable qualities can be produced and sold to help to support the family, is an effective feature in education. In Los Angeles a great number of vases, jars, lamp stands, wall lanterns, picture frames, candle-holders, book-ends, large baskets, etc., have been made and finished in the schools. An exhibition was recently held and the result was a revelation. The technical information and skill gained in the working out of the processes involved are of great value. The process of compounding sizes, whiting mixtures, compo mixtures, casting, pressing and affixing of ornaments, stippling, bronzing, burnishing, etc., the study of design and color scheme, the mixing and applying of colors in tints, tones and shades, are all of practical and educational value. The great variety of individual modifications of the processes that are possible and by which every individual in a class can give expression to her or himself, arouses the interest and evokes the will to do. With this comes a desire to know more, to know the "inside of things", and this leads to better and greater accomplishment, an objective which this work serves effectively.

In order to convey the right idea of this work as distinct from the much used polychroming and "gold painting", a description of the processes is presented.

GILDING—BURNISH GILT

This is a more complex and advanced process than the gold paint process. It is **Gilding.** Still it is not more difficult or expensive than gold paint.

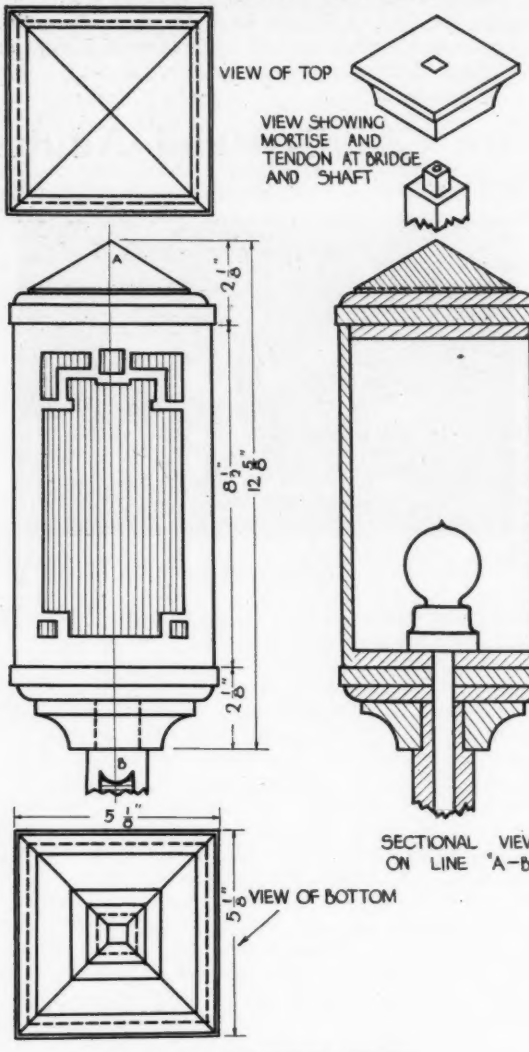
Synopsis of Processes

I. Preparation and Application of Glue Size.
II. Preparation and Application of Coat of Whiting Body and of Stippling.
III. Preparation and Application of the Gilders' Clay.
IV. Preparation and Application of the Gilt.
V. Burnishing the Gilt.
VI. Application of Lacquer over the Gilding.
VII. Preparation and Application of Glaze or Color to Obtain Antique and Chromatic Effects.

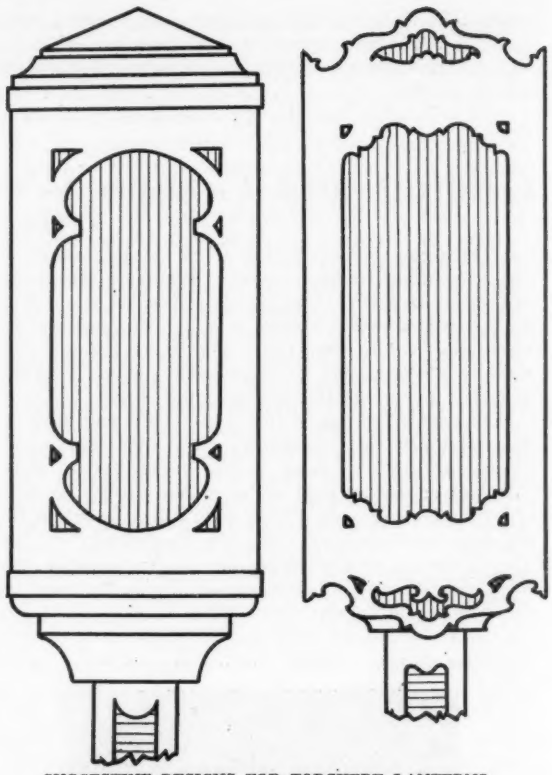
Analysis

I. Preparation of Glue Size:
1st. Put glue into a can with enough water to cover it. Let stand until the glue is soaked.
2nd. Set can of glue in a dish pan with water and heat until the glue is thoroughly dissolved.

TORCHÉRE LANTERN



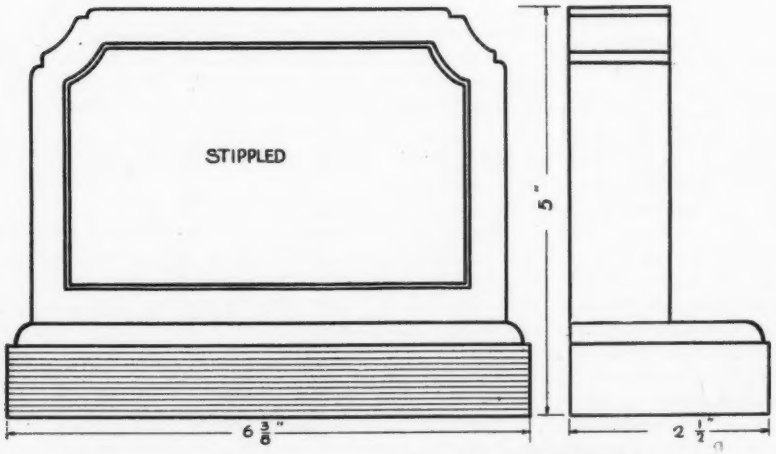
DETAILS OF TORCHERE LANTERN.



SUGGESTIVE DESIGNS FOR TORCHERE LANTERNS.

DETAILS OF GILDED ARTICLES MADE IN MR. KUNOU'S CLASSES.

BOOK ENDS



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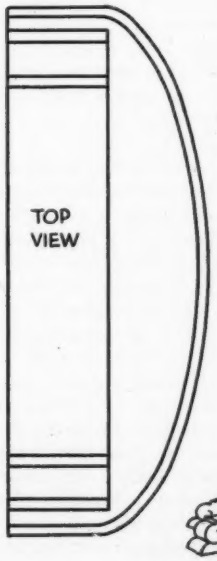
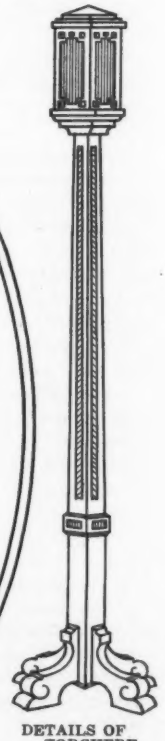
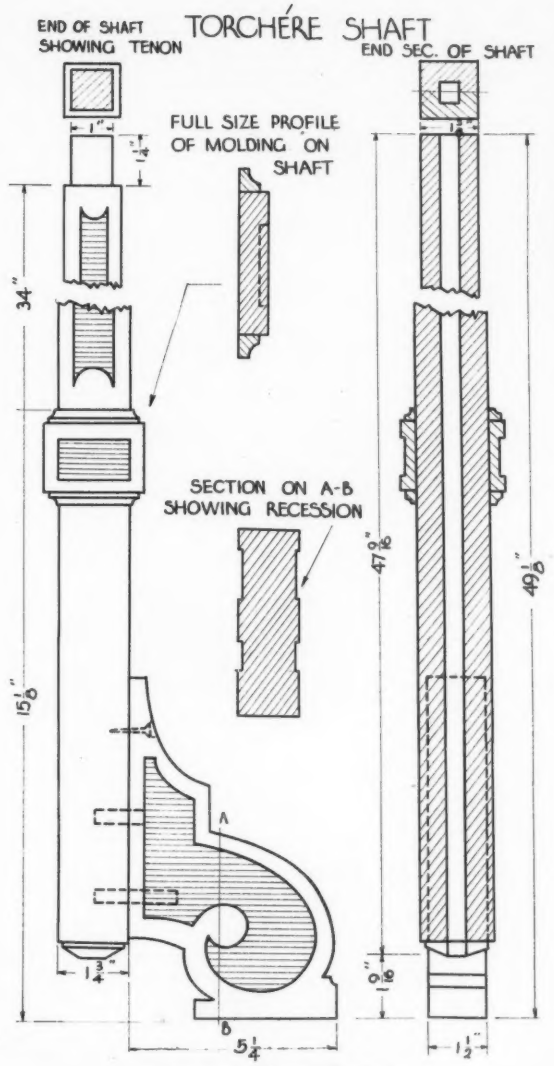


TORCHÉRE



DETAILS OF TORCHERE.



DETAILS OF TORCHERE SHAFT.

3rd. Dilute some of the glue, making a "size." (Too strong solution will check or craze.)

Obs. Never boil or heat any mixture to be used for gilding or compo work directly over the fire, but **always** in a pan with water in it.

II. Application of Glue Size:

1st. Apply glue size, hot, with brush. On porous surfaces use a stronger size than on compact surfaces.

2nd. Let dry.

Obs. This size is used on wood, burnt clay, plaster paris or other objects with porous surfaces.

III. Preparation of Body of Coating:

1st. Take hot glue size, mix with Gilders' bolted whiting (Danish) until consistency of syrup, stirring the mixture thoroughly.

2nd. Strain through cheese cloth into a can.

3rd. Stir and put in thimbleful, or thereabout, of boiled linseed oil.

4th. Stir and put in some alcohol. Oil and alcohol make the body of coating steady and soft.

IV. Application of Body of Coating:

1st. Apply coat of body, hot, with brush, as in painting, taking care not to return too often to same strokes, as the body sets, and "piles up."

2nd. Let dry.

3rd. Sand surface with No. 0 sandpaper, if stippling is not contemplated.

4th. Apply second or stipple coat.

5th. Stipple with brush or with finger tips. In stippling with brush hold it vertically, and light taps makes "fine stipple;" heavy taps makes "coarse stipple." The finger tips moved rythmically in the whiting produce "scroll" or "wave stipple." The stipple is done to relieve the monotony of flat surfaces and features of objects, and to obtain artistic effects in bringing out, "high light points," in the burnishing.

6th. Stand up and let dry at least 24 hours, or until the coating is bone dry.

7th. Sand thoroughly. No gritty particles remaining because "grit" works through the gold and will expose white spots. The whiting should have enough glue in it to produce a hard, shiny surface when sanded. If there is too little glue, the whiting surface is porous and soft; it will absorb the liquids of the mixtures applied over it, and the work is spoiled.

ADULTS' CLASS IN GILDING, COMPO AND POLYCHROME WORK, showing some of the objects made, such as porch lanterns, torcheres, floor lamps, picture frames, gilded and glazed terra cotta vases, jars and baskets. The instructor is shown in the background.

III. Prepare and Apply Gilders' Burnishing Clay as follows:

1st. Mix half of glue size, as before mentioned, and half of water, both hot.

2nd. Pour this mixture into a portion of burnishing clay in paste form. Stir until it thickens. Then put in more of the size and the clay gets thin. Keep adding and stirring until a consistency of syrup is obtained, all the while heating it in water.

3rd. Put a little alcohol into the mixture to prevent it from getting hard and dry. The alcohol also has the effect of making the clay puffy which is the desirable state. If clay froths when applied put in alcohol to remedy it.

4th. Apply two coats of burnishing clay, the second coat thinner than the first. Do not sandpaper the burnishing clay.

IV. Preparation and Application of Gilt:

1st. Put Gold Bronze powder into a clean tin can, say a coffee can, 1-lb. size.

2nd. Put in a small amount of alcohol, stir well, making a thin paste of the mixture.

3rd. Put in hot glue size, **very diluted**, testing with the fingers to determine the adhesion, which ought to be very slight.

4th. Heat the mixture, almost to boiling point, and stir. Watch that the mixture "acts" or "effervesces"—which is a sort of chemical reaction. If it does, it is right, if not it is questionable (as above stated all heating is done in water).

5th. Apply the Gilt with brush over the burnish clay. In brushing on, do not have too much in the brush, and work quickly. Do not be anxious if the first coat does not cover. Let dry about one hour (sometimes less). Apply second coat. In so doing press the brush against the edge of the can until it is almost empty and merely impregnated with Gold. Then pass over the object lightly and see that the covering is complete. Let dry about one hour.

V. Burnishing with Gilt:

1st. Place the object on a cushion or soft rag to protect it. Don't handle too much, it may affect the Gold.

2nd. Using caked bees' wax and rub some of it on a clean soft rag. Pass the rag over the gilded surface, to lessen the friction in burnishing, and prevent "going through."

3rd. Use a horn-shaped agate burnishing tool, and burnish the **high spots** until they **shine**. Avoid handling the cold surface with the fingers as much as possible. If the burnish is "flat" that is, not glossy, the glue size in the mixture is too strong. Make it weaker and observe the result. The burnishing must be done on the same day the Gold has been applied. If it stands over night, it is too old and will not burnish.

VI. Application of Gilders' Lacquer:

1st. Pour enough Banana Bronzing liquid to cover the objects, into a small, clean, tin can.

2nd. If too thick, dilute with acetate. Dilution is seldom required.

3rd. Brush on with camel hair brush or artist's flat brush. Brush quickly because the liquid "sets" instantaneously. Give one coat only. This lacquer affixes the gold and protects it. The finish is transparent and clear, remarkably durable, and if unmolested, the object will endure for ages, because it is enclosed within a calcious and metallic film.

VII. Preparation and Application of "Glaze" or Color:

1st. Put color, ground in Japan, into a small can or color cup.

2nd. Dilute with benzine to a thin mixture like an oil stain. Do not use turpentine.

3rd. Apply with brush all over lacquered surface.

4th. Wipe off with cheese cloth or waste, so that the burnished high spots are cleared and most of the color remains only in the recesses of the surface. The effect is now that of antique gold in the color used. The color dries quickly.

5th. Small features may be touched up with diluted color of a contrasting hue, to bring out chromatic interest.

LIST OF BRONZES

Standard

Gold Bronze Powder, Deep, Burnish.
Gold Bronze Powder, Pale, Mat.
Gold Bronze Powder, Brilliant.

PLATE 13.

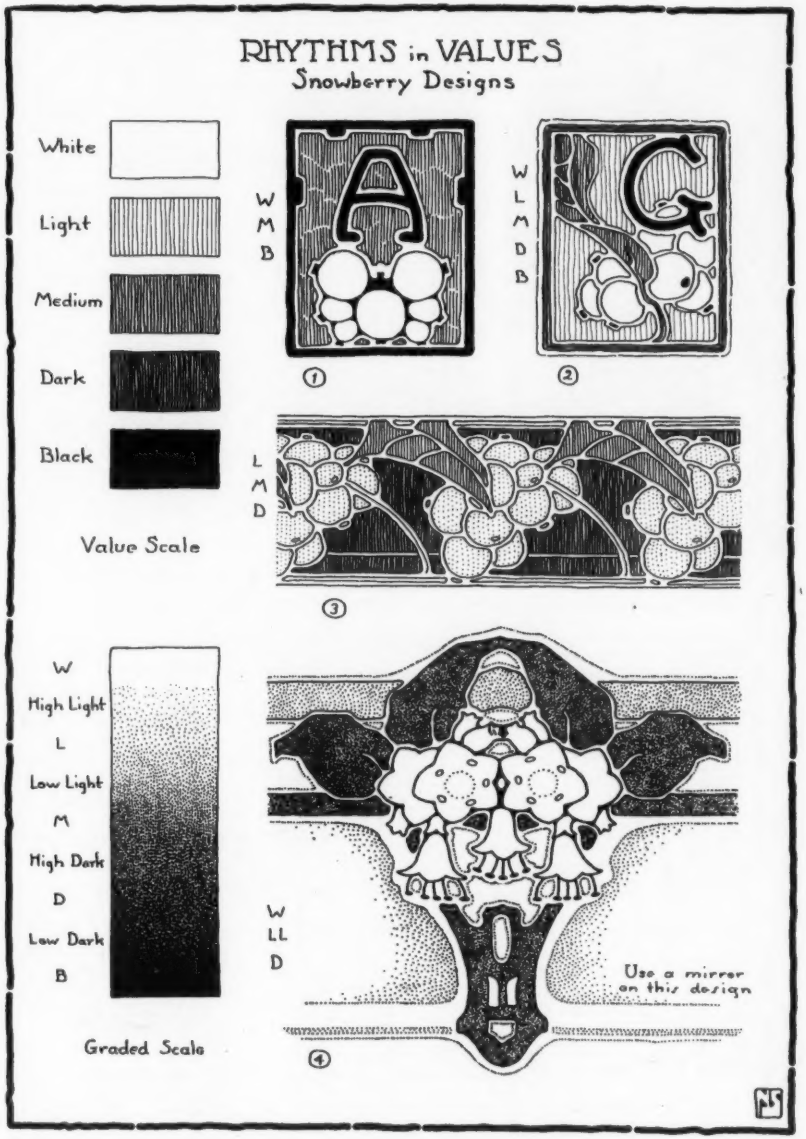


PLATE 14.

Silver Bronze Powder, Burnish.
Silver Bronze Powder, Brilliant.

These bronzes come in ounce paper packages or in one-pound cans, with friction tops. The bronzes must be of standard quality. Cheap and adulterated bronzes abound in the market. Such cannot be used to obtain right results. There are bronzes of all kinds and colors, chromatic bronzes, such as blue, green, red, copper, etc. The brilliant silver and gold bronzes do not burnish.

SPECIFICATIONS OF MATERIALS FOR GILDING COMPO AND POLYCHROME WORK FOR ELEMENTARY SCHOOLS

Acetate (for dilution)
Alcohol, denatured.
Benzine.
Bronze powders (see description before).
Bronzing Liquid.
Clay, Gilders' Burnishing, gray and red, paste form.
Glue, common.
Glue, Cooper's X Transparent.
Gilders' Banana Bronzing Liquid.
Japan Dryer.
Oil, coal.
Oil, lard.
Oil, linseed, boiled.
Oil, linseed, raw.
Pitch, Burgundy.
Plaster, paris, quick set.
Pumice Stone, powdered.
Resin.
Sandpaper, No. 0, No. ½, No. 1.
Shellac, flake.
Shellac, orange.
Shellac, white.
Stone, rotten.
Turpentine, clear.
Waste, cotton, white.
Wax, Bees'.
Whiting, Gilders', Bolted, Danish.

Colors Ground in Japan

Black
Blue, cobalt
Blue, Prussian
Green, chrome, medium
Red, vermillion
Sienna, burnt
Umber, burnt
Umber, raw
Yellow, chrome, medium
} In friction top cans or in tubes.

Equipment

Brushes, Artist's flat, ½".
Brushes, Artist's flat, 1".
Brushes, Camel hair, ¾".
Brushes, Camel hair, 1".
Brushes, Sable, 10", No. 3.
Brushes, Sash tool, 1".
Burnishing tool, agate, horn shape.
Gas plate, two burner, for heating.
Pans, dish, granite, oval.
Pans, sauce, 2 qt., granite.
Tin cans, used, clean, such as coffee and tomato cans, pint, quart, and gallon sizes.

Wild Flower Designs

Article VII. Tonal Values

Nettie S. Smith, Smith Center, Kans.

The Snowberry. During autumn and winter the snowberries are beautiful in snow-white clusters with their dark, waxy leaves. The name, *Symphoricarpos,* refers to the berries, meaning fruit borne together. The shrub is related to the coral-berry which is more common in many localities. In the spring these bushes bear many small, perfect flowers of the most delicate pink and white, with pointed petals and downy throats.

A Drawing in Three Tones. The under side of the leaves is lighter colored than the upper, and this offers good opportunity for decorative treatment in the drawing. The spray is shown in three tones or values—White, Medium Gray and Black.

The Value Scale. In Plate 14 is a scale of five values —White, Light, Medium, Dark, and Black. This is a rhythm—movement with graduation—from White to Black. A value scale might contain many more tones than this shows, but these are the ones most easily recognized and most commonly used. They are designated by their initial letters.

The Use of Values in Design. We have found that designs can be very effective in only two values, White and Black, or Light and Dark. Other tones add interest however, and give variety. When more than two are used they should be those having equal steps between them, as indicated in Plate 14.

Ways of Producing Values. The values may be made in different ways, transparent water-colors, opaque water-colors, pen lines, stipple, tonal papers, etc. The student should make the five-tone value scale in these different ways in order to develop his appreciation of values and his ability to produce a desired tone.

Gray Paper Designs. Interesting three-tone designs may be made by cutting or tearing parts from white and black paper and mounting them on gray. Then the tones can be reversed, mounting white and gray on black, or gray and black on white.

Pen Technique. For the light tone in the value scale a fine pen was used, and for the other tones a ball-pointed pen, with the lines close together for the dark value. Pen tones are often made interesting by various patterns. In design (1) a "Speedball" pen was used for the letter and the border. These different pens are a great help in producing good pen work.

The Graded Scale. The stipple scale from white to black being graduated shows more than five tones, and for convenience we can call those between the original five High Light, Low Light, High Dark and Low Dark. This gives us nine values from which to choose. Design (4) uses three of these which are at different intervals than those in the other designs.

Graded Scale in Wash. To make a graded scale with transparent water-color draw two perpendicular parallel lines about two inches apart and wet the paper between the lines. While it is still damp begin at the top with a brush stroke straight across with clear water. The next brush stroke should bring a little black water-color, the next a little more, and so on using more paint until solid black is reached.

Rhythms in Color Tones. Scales in color are useful and attractive. For a five-tone scale in blue use very light and very dark blue instead of white and black. The graduated scale is made in the same way as was described for the neutral scale, beginning with white, then adding color gradually and ending with deepest blue. This can be done with any color, especially the darker ones, and as graded washes are more beautiful for some purposes than flat tones they will be used frequently.

Greeting Cards. The initial letter designs may be traced on greeting cards, outlined in India ink, and a wash of brilliant red water-color used for the medium tone. Green is also effective with black and white and could be used for background in either flat or graded wash. A touch of gold outline or lettering will make the cards more festive and is easily applied with the ball-pointed pen.

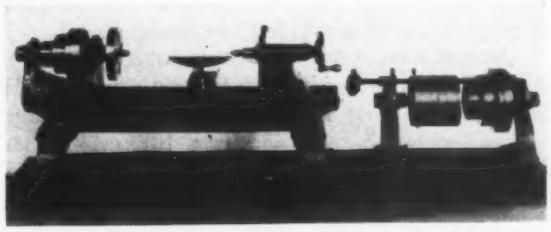


EXHIBIT OF MACHINE SHOP PROBLEMS AT THE RAMON DE BALDIOTORY SCHOOL, SAN JUAN, PORTO RICO.

INDUSTRIAL-ARTS MAGAZINE

E. J. LAKE S. J. VAUGHN
Editors

EXTENDING THE GUIDANCE AND ADVISEMENT WORK

Like every new field, vocational and educational guidance has been a fruitful field for the faker, the incompetent "psychoanalyst," and the imposter. In spite of this, there have already been accomplished some remarkable results in the guidance work..

Too often this work has been narrowed to the simple guidance toward more or less temporary jobs instead of life careers. The tendency has been far too much this way in the field of industrial work. In other fields, often the work has been the most superficial surveys of various occupations, and it has frequently been given by those who are unfamiliar with the occupations under discussion. Nevertheless, a real place exists in all of the vocational work for both vocational and educational guidance.

A field of guidance that has been all too long neglected is the college field. It is pathetic to hear the helpless cries of the incoming multitudes of high school graduates who apply to the colleges and universities for education. They have had but little guidance of any sort and that little is usually such as applies to trade education. They do not know what they want and they have but little idea of their own special aptitudes or abilities. In many cases, their preparation has not been in line with their evident likes and aptitudes. Here is certainly a rich field for guidance and advice.

There is a pressing need in every college and university for a person or department to take underclassmen in hand, to find out their native talents, to experiment with their aptitudes and their tastes, and to try to adjust their courses of study to their evident needs. Surely, it must be a stupid and impossible situation when the vast majority of university graduates have but little notion of what they are going to do for a livelihood and much less notion of what they are fitted to do. The teaching business is overrun by such aimless and purposeless people who have blundered through college or university without knowing what they were driving at, and who finally drift into teaching because they really can't do anything else, or at least they do not know of anything else they can do.

Many a misfit could be saved to happy and profitable work by a little wise and friendly advice on the part of a skilled and experienced adviser. The college and university life and work would likewise profit immeasurably by such a scheme. It would become more purposeful. Aimlessness and loafing would become less common. The practical courses would become more responsive to the needs of the students and more definitely related to the work of the world toward which the students are headed.

Tradition has long held sway in the colleges and universities. It may be a long time before any widespread response is made by these institutions to this perfectly apparent need. The time will undoubtedly come, however, when every worthy institution of higher learning will be adequately provided with a staff of guidance experts and all the proper facilities for taking as far as it is humanly possible the guess-work out of the preparation for life and the selection of a life career.

SECONDARY LIFE MOTIVES

For the past quarter of a century, at least, there has been great danger of putting secondary life motives first. In this competitive civilization, success has by common consent been attributed to the man who acquired the most wealth and property. This is success on a low level and without spiritual significance.

What the individual *contributes* to the common good in payment for the numberless services rendered him by his fellowmen is a much better gauge of success than the amount of money or reward he exacts for his work.

In the field of industrial education too much stress has probably been laid upon the amount of the wage and not enough upon the *value of the job* to society and to the individual in helping him to expand and to express himself for the common weal.

The individual can be taught that richness of life and abundance of satisfaction can be more easily and surely attained by considering his job as the means by which he can make his contribution to the needs of the world. In this view, the compensation becomes incidental. This is not saying that compensation or reward becomes unimportant or even less important. It means that the compensation becomes the just and necessary consequence of the job well done and in that sense only is it incidental.

There is a constant temptation to get the "cart before the horse." People generally think they work primarily for the price the labor brings. Wherever the ideal of labor has risen no higher than this, the life of the worker is a barren one indeed. If the price were all, then in the absence of price there would be no work. The compensation is important only to the extent that it brings comfort and contentment to the worker and his family. But what about the possibility of one's comfort and contentment if his fellowmen are without comfort and contentment? Every consideration ultimately affects the common welfare.

If the young worker is taught that *success lies in the work which he has the aptitude and ability to do for the common good* there will be no trouble in a decent state of society about the compensation. And there will be compensations which the mere wage cannot bring.

THINK

It is a fatal act to take one's job as a matter of course. To go on the assumption that because your task is such-and-such today it will be the same tomorrow is folly.

Yesterday a man may have been employed to do a certain task that has a certain status in the field. Tomorrow that business may have a greater output and a higher status. That means that this man's job has grown proportionally and that he must expand with the requirements of the task.

As a business grows each department spreads with it, and it is so with schools.

A growing school is like the surface of a balloon in process of inflation. As the balloon expands, every line on it expands in equal proportion, and as the school system grows every teacher must grow with it.

For example, let us say, a man is hired to handle a stock of goods. He may be able to keep the small stock of today in order and properly requisitioned; but, if he does not think out the task of today in that small stock room he may find himself a helper and not the head of the stores department tomorrow, when the requirements are much more exacting.

The teacher who does not think out his job will most likely find himself still a teacher when the exigencies require a principal, a supervisor, or a superintendent.

In certain lines of business, men advance in rank through retirements or resignations by right of seniority. In the teaching profession they advance through thinking beyond the job of today into that of tomorrow.

To the pupils, the biggest asset of the school are the men and women who make up its enthusiastic teaching organization.

One of the very best mental lubricants for the individual in an organization is the enthusiasm of the whole. In an atmosphere of loyalty one will think out his job almost every time if he has any thinking to begin with.

It is a rare thing to find a discontented man in an enthusiastic organization, unless he be one who is discontented with himself.

There are two kinds of discontent: that which, being dissatisfied with self, works; and that which, satisfied with self berates surroundings. The first usually gets what it wants, the second loses what it has.

And thus it goes in this world into which we are all put to work and think—the thinking being a leading factor in our work—*E. G. Limprecht, Lincoln, Nebraska.*

"THE WORLD DO MOVE"

An old lady came down out of the hills of Kentucky for the first time in years—perhaps since her wedding day. She saw many new and strange things and dazedly said, "The world do move."

The world changes for the old woman from the hills and it has changed for you and me, but most of all it has changed for the boy in the small community.

Once upon a time this boy was expected to feed a horse, curry him and hitch him to the buggy or spring wagon. Today the boy is expected to grease and oil the family flivver and repair its tires.

Saturday was often a day for close acquaintanceship with the ax and buck saw and oak fire wood. The boy of today has other jobs saved up for him such as repair of the vacuum cleaner and the electric iron.

THE HAMMER JESUS SWUNG

Charles M. Sheldon

If I could hold within my hand
The hammer Jesus swung,
Not all the gold in all the land
Nor the jewels countless as the sand
All in the balance flung
Could weigh the value of that thing
Round which his fingers once did cling.

If I could have the table He
Once made in Nazareth,
Not all the pearls in all the sea
Nor crowns of Kings or Kings to be
As long as men have breath
Could buy that thing of wood He Made—
The Lord of Lords who learned a trade.

Yea, but His hammer still is shown
By honest hands that toil,
And round his table men sit down
And all are equals with a crown
Nor gold nor pearls can soil;
The shop of Nazareth was bare—
But Brotherhood was builded there.

Leisure time was spent working with the old wood working tools at the bench in the barn. Now the barn is gone and a neat flivver fitting garage has taken its place. Lucky is the boy with work shop in cellar or attic. He is busy at radio sets, battery charger, or working over a flivver into a "bug."

In the old days wagons, buggies, houses and play things were largely made of wood. Boys worked with wood in their play. Manual training was largely manipulation of wood working tools and the boys in those days were interested in it for it functioned in life and their hobbies.

Today wood is used less and less. The automobile, the toys, washing machine, radio and many other things are made of metals of various kinds. It is a metal working age in which the boy of today is living and working at hobbies.

No longer is he so interested in wood working. His solid oak and mahogany furniture is more expensive and less interesting each year. He does crave a chance to make a B battery charger, a toaster, an all metal skooter and learn more about the family flivver. He wants to be able to put extra lights in his room and shop and be able to repair the lawnmower, the cord for the electric irons and overhaul the electric fan. He dreams of the time when he can build a seven tube radio set which will bring in London every night.

With such cravings our modern boy is demanding Home Mechanics in place of furniture making. He wants his manual training brought down to date. There is more educational value for him in the Home Mechanics.

He has a right to training for the equipment of the life which surrounds him.—*Laurence Parker.*

PROBLEMS *and* PROJECTS

AN EASY PROBLEM FOR THE JUNIOR HIGH SCHOOL SEVENTH GRADE

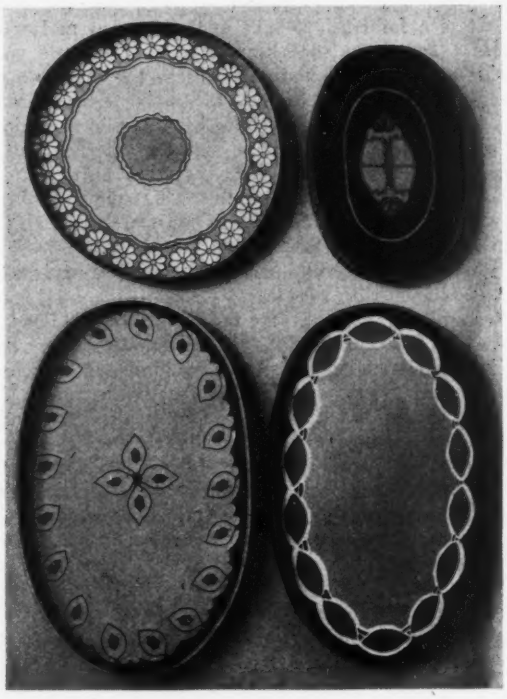
Ethel Ernesti, Art Teacher, North Junior High School, Colorado Springs, Colorado

To teach boys and girls thoughts of economy through art, we carefully preserved the left-over pieces of builders' board from our stage settings. We also watched whenever repairs were made upon stairways or other places, and old linoleum was taken up. We pounced upon it like vultures and stored it away.

GROUP OF TRAYS.

The illustrations show what we did with these left-over materials, which otherwise would have gone into the discard. Planning and cutting out the bottoms of the trays was not so difficult, but the truing of the edges with the rasp and sandpaper, took more care, and we did it. Then we cut the strips of linoleum to go around the edges, one inch wide, to be fastened with small flat head brads. Any little opening where the bands joined or around the edge were filled with reliefo, or when not at hand, whiting was used to fill in the joints. The bottoms were covered with attractive wallpaper selected from sample books.

The decoration of these serviceable articles need hardly be discussed, however; fitness to purpose was never for a moment forgotten and we tried in every way to conform to the principles of design and decoration. The coloring which unfortunately cannot be shown in the reproductions, was very charming, and showed that we had grown in understanding of color matching and harmony. This was done with poster colors and several coats of valspar varnish finished the product for the market or for the individual home. Every boy and girl of the class entered with spirit and interest into the work.



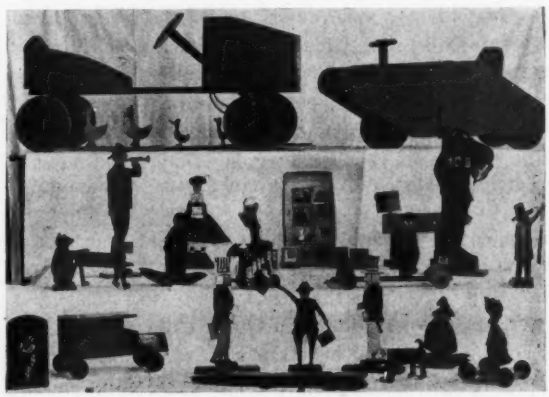
GROUP OF TRAYS.

While a rich school may easily produce this sort of tray with new and best material, it certainly can be done anywhere, as no rich tool equipment is needed to do the work. There is something worth while for boys and girls to learn to make use of left-over raw material from other projects. Left-over materials are valuable; let us learn to think what we may do with many things now discarded. As the saying goes, let us learn to make use of the margin, and so become more and more worth while men and women. I hope some one else will try out this problem.

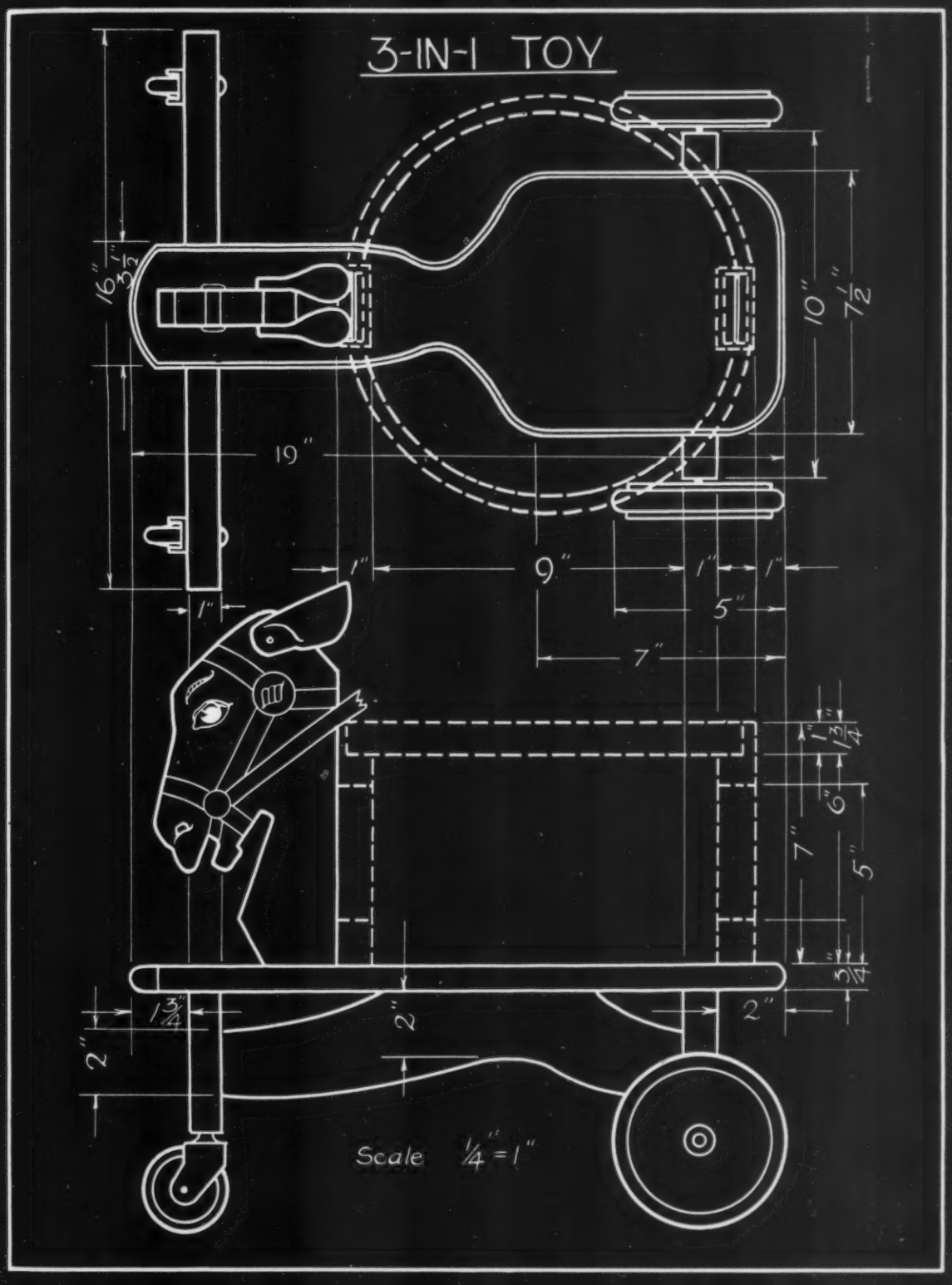
SEASONAL AND COMMUNITY PROJECTS

James E. Barron and Earl W. Thrall, Instructors, Senior High School, Beloit, Wisconsin

Two thousand years ago Three Wise Men, hoping to find the fulfillment of a great promise, followed a star across the hills and plains of Palestine. Gifts, rare and



TOYS MADE FOR DISTRIBUTION TO UNFORTUNATE CHILDREN.


3-IN-1 TOY
16" 1 1/32"
10"
7 1/2"
19"
1"
9"
1"
1"
5"
7"
1" 1 3/4"
6"
7"
5"
3/4"
1 3/4"
2"
2"
2"
Scale 1/4" = 1"

A Three-In-One Toy

Charles M. Rice, Everett, Washington

This toy has proven to be a very useful article for children more than eight months old. It will serve for a "Walker" at first. Next, by attaching a tongue or leather leash, it serves in place of a sulky cart for the street. With the ring removed, it becomes a play horse for an older child. With the exception of a few items, the drawings will explain the construction.

Base. Similar to a Kiddie Car, with the front wheel omitted. Fasten together with 1¾ x 9 F. H. B. screws. The front axle is 16″ long.

Ring and Posts. The ring is made from two thicknesses of thin strap iron which is driven into the saw cuts at top of the posts. The posts which hold the ring are made from 1″ material and are 2½″ wide, 7″ long. The ring is protected by winding a layer of small rope over it.

Head. The head is made from one inch material. The ears are cut from leather (doubled) and fastened to the head with tacks. The bridle is painted on the head and the reins are fastened with two floor glides.

Wheels and Casters. The wooden wheels may be held in place with 3″ R. H. B. screws. Any noiseless type of ballbearing caster will do, but if the toy is to be used outdoors, the tea wagon casters should be used. (If disc wheels are preferred, they are listed in the Thurston catalog.)

For guiding the toy on the sidewalk, a tongue made from ¾″ dowel stock is used. This has a snap fastener at end to hook into the screw eye on the head.

SUPPLEMENT TO THE INDUSTRIAL-ARTS MAGAZINE, DECEMBER, 1925.

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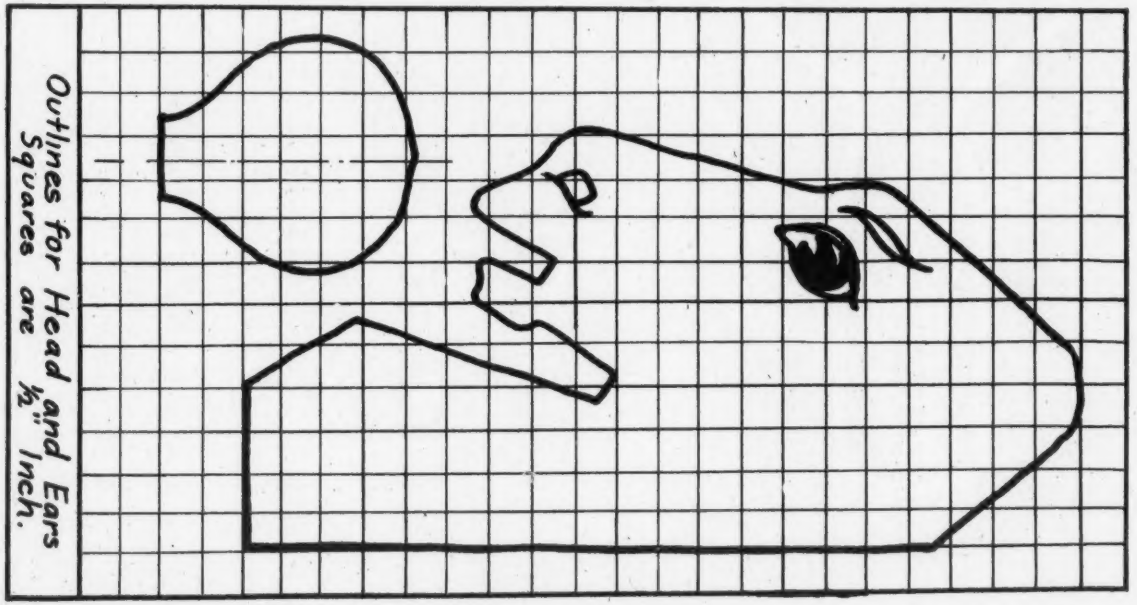

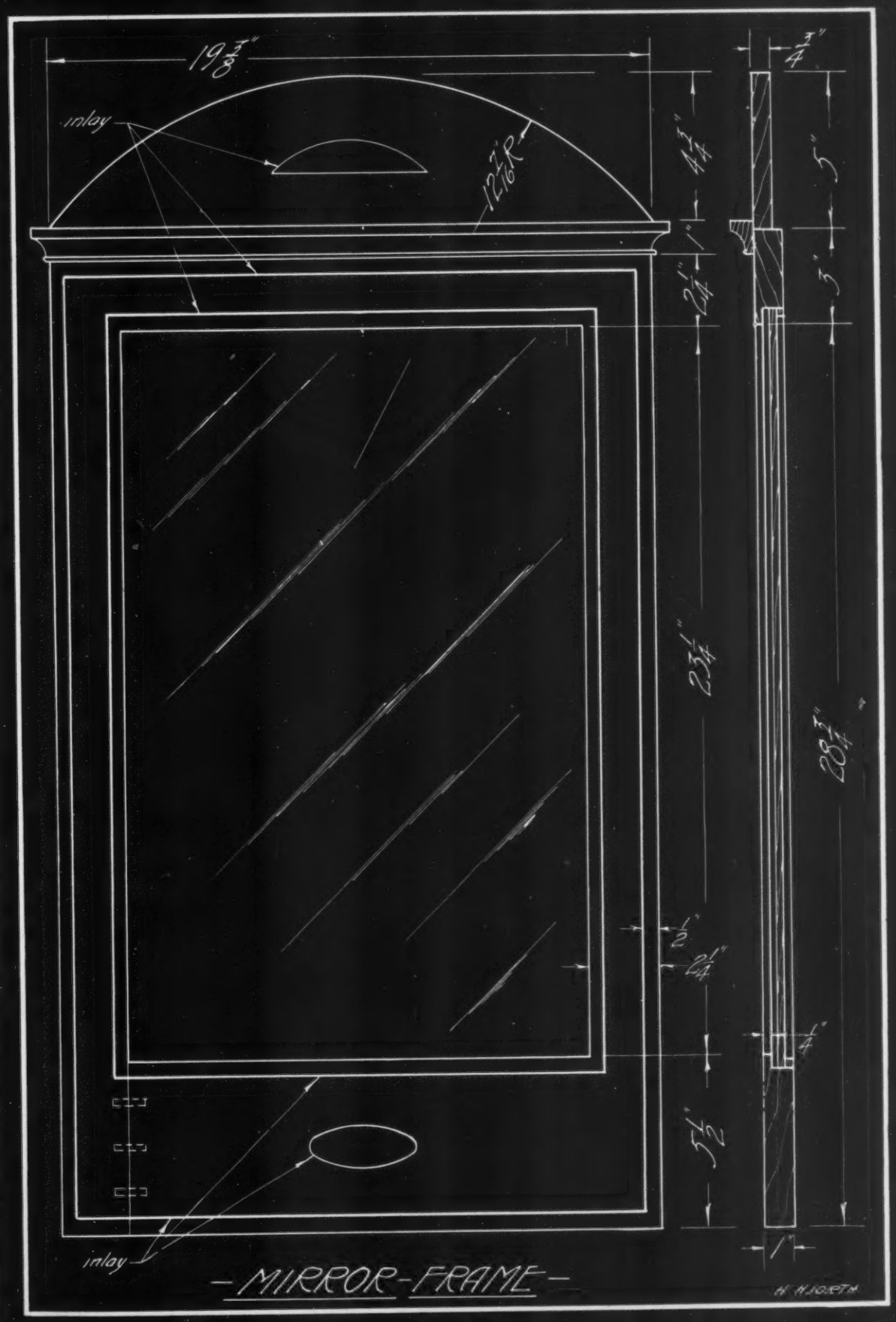
19 3/8"
inlay
12 1/16" R
4 3/4"
4 1/4"
1"
2 1/4"
5"
3"
23 1/4"
28 1/4"
1/2"
2 1/4"
1/4"
5 1/2"
1"
inlay
MIRROR-FRAME
H. H. ROETH

Mirror Frame

Herman Hjorth, New York, N. Y.

The mirror frame illustrated is suitable for a hall, but may also be used in a bedroom or in a living room. In the former it should preferably hang over a dresser or bureau, and in the latter it may hang on a pillar or narrow space between two windows. It is essentially an eighth grade problem, so simple of construction as to hardly need any description. The frame, as shown by the drawing, consists of four pieces joined in the corners by dowels. Before gluing up, however, the groove for the glass and backing should be cut on the circular saw. In the present case this groove was made ¾" deep and 7/16" wide.

After the frame has been glued and planed, it may be inlaid as shown. The two inserts may be bought from any firm manufacturing marquetry. They will be found to be set into a piece of veneer and have a piece of brown wrapping paper glued to one side. Cut off the surrounding veneer with a pen knife, locate the position on the frame carefully, place the insert face down, and mark around its edge with a sharp steel point or pen knife. Remove the insert and cut down carefully on the line, marking the outline of the insert. Use a sharp router plane to lower the surface to a depth equal to the thickness of the insert and glue in place, face down. The inserts, like the lines of inlay, should fit so tightly that they must be gently forced in place. Clamp or place a weight on top of the insert until dry. When scraping, the brown wrapping paper will be removed and the design of the insert will appear. The inserts should not be glued in place with wrapping paper down, because paper prevents a good bond from being formed between the wood and the insert.

The upper rounded piece is simply glued to the top of the frame, the joint being covered by the strip of moulding. If a shaper is not available, the moulding may be gouged out by hand, as was done in this case. After placing the mirror in the frame, it should be covered with heavy paper, after which a backing of ¼" stuff is nailed in place. Heavy paper is glued over the whole back to prevent dust and moisture from spoiling the glass.

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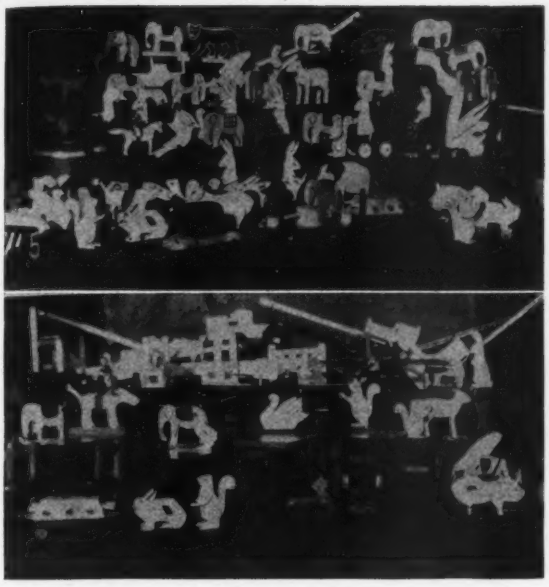


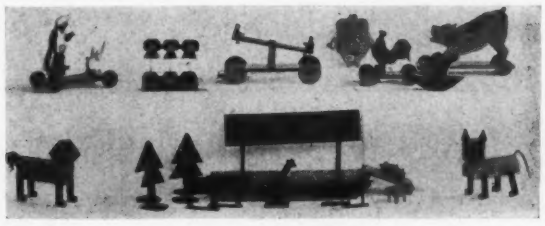
CHRISTMAS TOYS MADE UNDER THE AUTHORS' DIRECTION.

beautiful, they laid at the feet of One who was sent that the prophecies of old might come to pass.

Every year for twenty centuries, the Christian world has commemorated this event by the giving of gifts and by the exchange of a simple word of greeting, "Merry Christmas". Though old as Christianity itself, the greeting is always new and each year gives us a new significance of the day.

The teachings of peace, the symbols of universal brotherhood, should warm and brighten any part of the heart where hate and jealousy are wont to lie so that every unkind thought will vanish, and only the love of fellowman remain. Good citizenship and good citizens reflect this attitude in every community. Does it extend to the school system, its pupils and its teachers?

In every school are those from homes where Christmas cheer is lacking. The manual training department of the Beloit senior high school has endeavored to reach such homes at this holiday time. Over two hundred good, substantial toys were made in 1924 by manual training classes for free distribution. These toys included animals on wheels, animals with movable parts, carts, aeroplanes, autos, jumping jacks, puzzles, doll chairs, doll tables, doll carts, and doll beds. All toys were made from small scrap lumber or from box lumber, so the actual expense of the products was slight. Paints, brushes, stains, and shellac were practically the only cash expense.



CHRISTMAS TOYS.

The pieces of doll furniture were excellent products, and excelled the ordinary commercial products because they were more durable and practical. They were made from ¾-inch squared stock, obtained by ripping up narrow scrap stock and shaky board ends. The accompanying drawings show the simple and strong construction.

Any manual training department can easily save enough waste material during the school year to make a huge supply of such toys. As soon as we get a small or narrow piece of board we rip it into squared stock, or cut out an animal. Whenever a worker in the shop claims he has nothing to do, we give him the materials for a toy to plane up and assemble, with instructions to turn it in when ready to paint, and *we give him a mark on this piece of work*. This serves a double purpose.

At holiday time, our boys all expressed a desire to make a gift to be used by the local charities. By mutual agreement, the work on this Christmas gift was graded for the test mark for the current month. In this manner, several hundred toys were accumulated and turned over to the local charities, who have the official lists of the needy homes in the city.

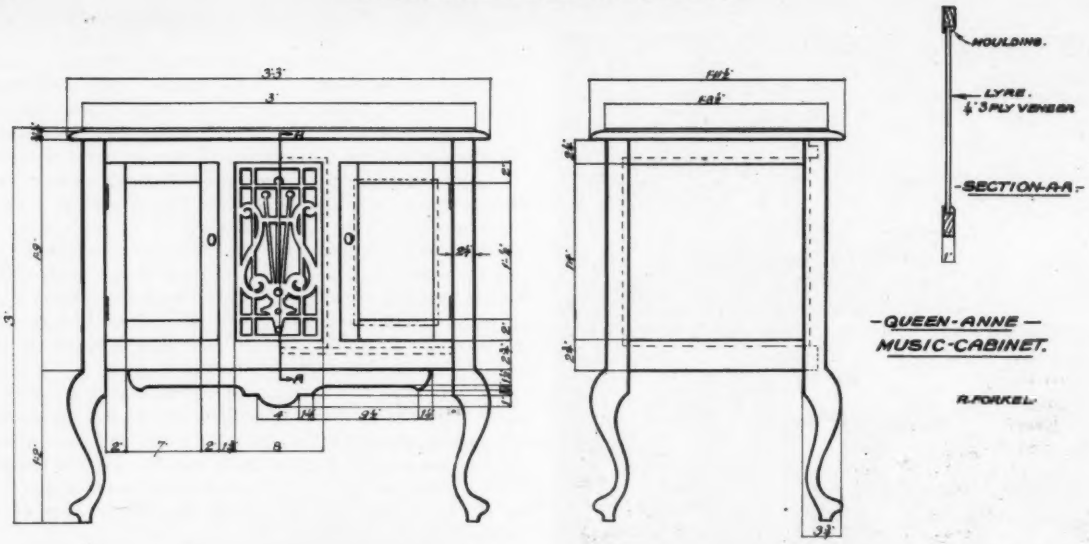
Pupils should learn, through the schools, that life is a problem; that while some are prospering, others may be unfortunate, and even need the help of others. As good citizens we must remember others, we must not live within ourselves. Begin today, to lay your plans and save your lumber supply for Christmas time. It will bring great satisfaction and brighten the day for many young children who are too young to fight their own way out of unfortunate circumstances. Bread cast upon the waters often returns when it is least expected and when the need is greatest.

RENAISSANCE FURNITURE

Reinhold Forkel, Instructor in Crafts, Trenton, New Jersey

The Renaissance period in art and architecture began in the fourteenth century, when humanity turned away

A MUSIC CABINET (See Next Page).



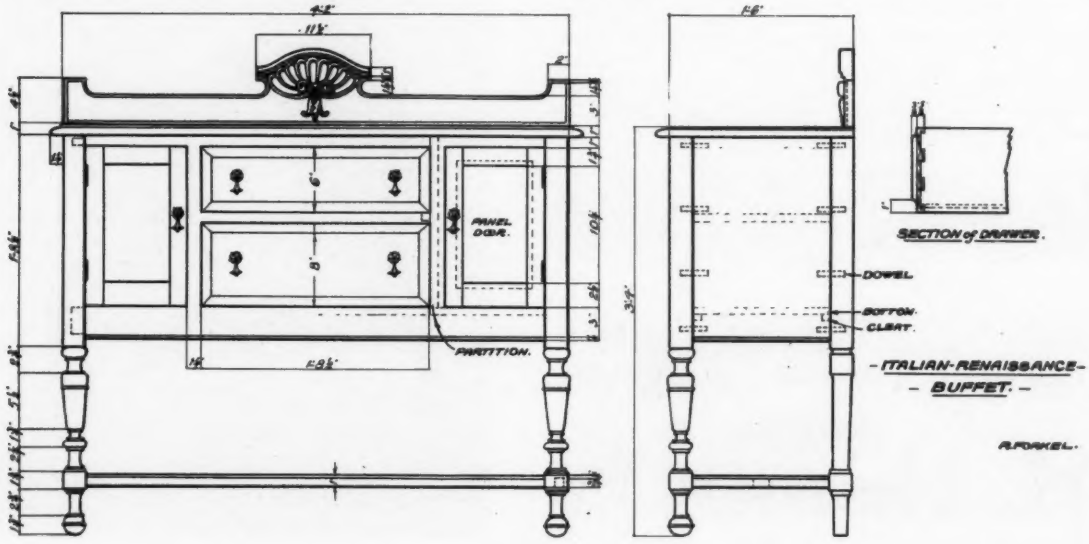
A BUFFET SUGGESTING ITALIAN RENAISSANCE ORIGINS.

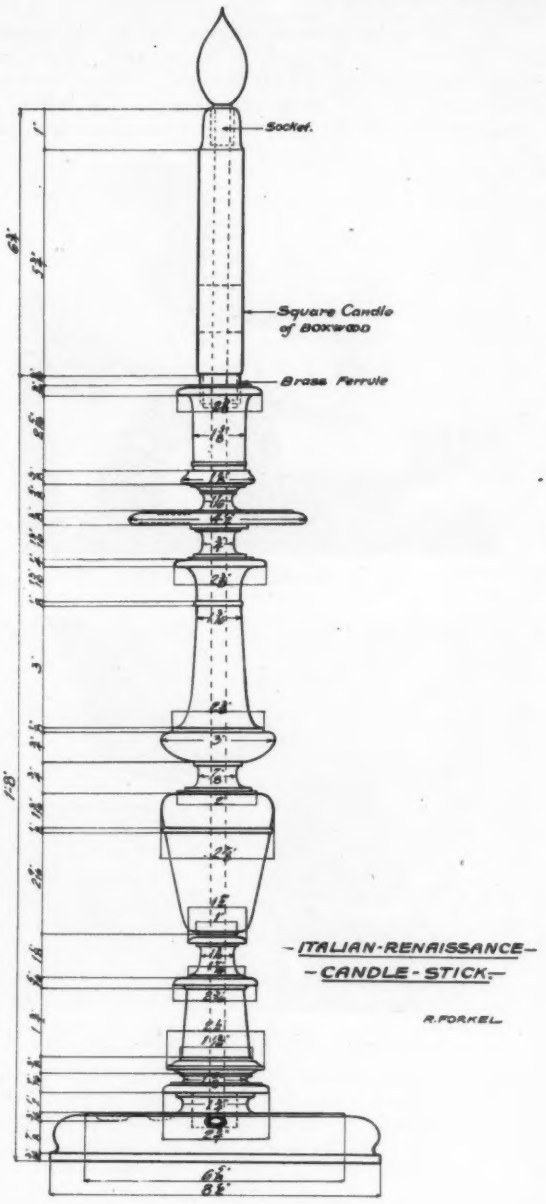
from the old customs and standards of the Gothic period. The new movement began in northern Italy, and rapidly spread over all the other countries of Europe. Men of great spirit appeared and laid new foundations for a new life in art, science, and government. Italy became the leader of the entire Christian world in literature, arts, and architecture. Florence, Venice, Padua, and Rome became the homes of numerous artists and craftsmen whose beautiful work we still admire.

The Renaissance styles give the artist more freedom and range than the Gothic styles, and greater opportunity for enriching surfaces and varying outlines. The ancient monuments of Italy afforded the Renaissance artist vast sources of inspiration, and nature was freely drawn upon for aid in design.

The accompanying photographs and working drawings represent pieces of furniture having a close similarity to the Italian Renaissance. They are pleasing in design and easily within the ability of students.

The buffet is constructed of mahogany with a brown finish, varnished and rubbed to a dull gloss. The design, proportion and spirit of the piece are in keeping with Italian Renaissance furniture. The turned legs in the front, and the square legs in the back, improve the archi-





tecture of the lower portion. The moulding applied to the front of the drawers, and the period handles carved on the top board, add to its beauty and refinement.

The Renaissance candle-stick is a close study of the original in the Metropolitan Museum of New York. The lover of art cannot help but admire the graceful design and the fine effect of Renaissance art as applied to this candle-stick. To meet the present day conditions, this candle-stick is fitted for an electric light with a square candle, which is effective and gives a good contrast. The candle-stick is made of walnut, French polished.

The music cabinet is in the Italian style, but is based on Queen Ann furniture of the later English Renaissance. It is constructed of mahogany, stained brown, varnished and rubbed to a dull gloss. The cabinet is intended for keeping music rolls and is typical in feeling of the later Renaissance. The legs are cut from 3¾"x3¾" stock, and give an opportunity for excellent hand work.

A JOB SHEET FOR THE HOME MECHANICS OR THE GENERAL SHOP

F. E. Tustison, The Stout Institute

Job Specifications. To make a metal bracket using iron rivets in the joint.

Reason for Job. Riveting is one of the common methods for joining metals together. We learned to set tinners' rivets while making a holder for an electrical heating element. Larger iron rivets are used to unite

FIG. 1. COMMON RIVETS.

heavier pieces of iron in a similar manner. The common iron rivets have round or countersunk heads. (See Fig. 1.) Small rivets can be headed cold. Large rivets must be inserted and headed hot. We will use small round head and countersunk rivets in today's job.

Material. Strap iron, ⅛" x 1", ⅛" x ½", 3/16" x ⅜" iron rivets.

Tools. Rule, hack saw or cold chisel, mill file, center punch, brace, and twist bits or bench drill and bits, countersink, anvil and vise, ball peen hammer.

FIG. 2. BRACKET SUPPORTING PORCH LAMP.

PROCEDURE: (1) *Determine size and style of bracket.* (See Fig. 3.) The above bracket is suitable for a small lamp or hanging basket. If a larger bracket is desired, make a sketch and have it checked by the instructor. See Fig. 4 for a shelf bracket that can be made from the brace in job sheet No. 23.

(2) *Cut stock to length.* (See Fig. 3.) Use hack saw or cold chisel. Strap iron can be sheared with the vise and cold chisel as in Fig. 5. Cut from both sides. The stock for the hook is 2½" long.

(3) *Point and shape the ends.* Point with hack saw or cold chisel. Hammer the edges of the ends flat to make them arrow-shaped. Use the ball of the hammer in finishing to give a better appearance. (See Figs. 3 and 6.)

(4) *Drill holes and countersink.* Locate holes and center punch. Drill all but bottom rivet hole in the back piece. This hole is drilled after the top piece is riveted to the back and the brace is bent and held in place.

(5) *Shape the top piece.* Start the hook by measuring back 2½" and bending in the vise about 45 degrees. Form the hook over the anvil horn by starting as in Fig. 7. Bend the right angle in the vise.

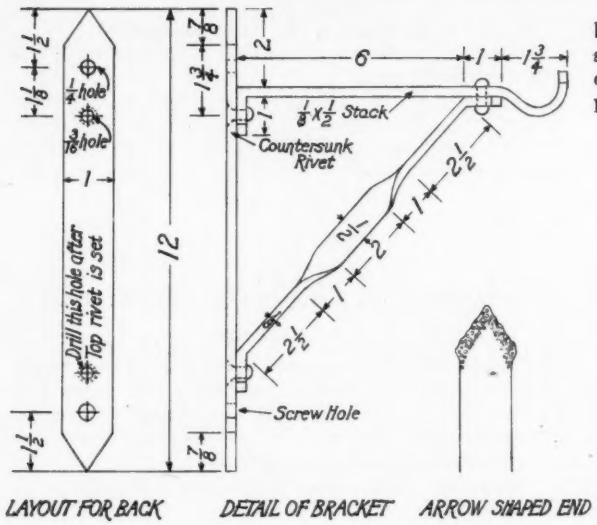


FIGURE 3.

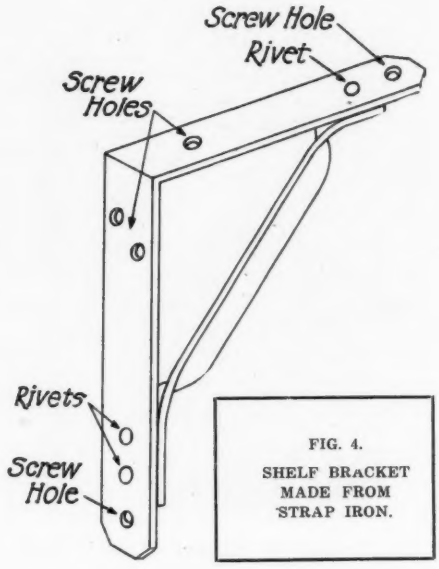


FIG. 4.
SHELF BRACKET MADE FROM STRAP IRON.

FIG. 5. SHEARING WITH VISE AND COLD CHISEL.

(6) *Rivet top to the back.* Note that the rivets must be countersunk on the back of the bracket. The rivet should project enough to form the head. Place rivet head on an anvil or solid metal plate and use the ball of a peen hammer. Strike the center of the rivet first and

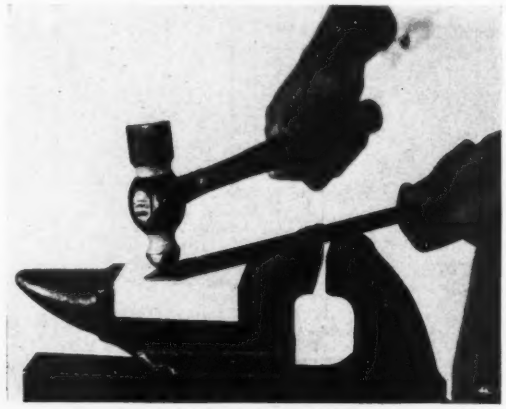


FIG. 6. HAMMERING THE ENDS.

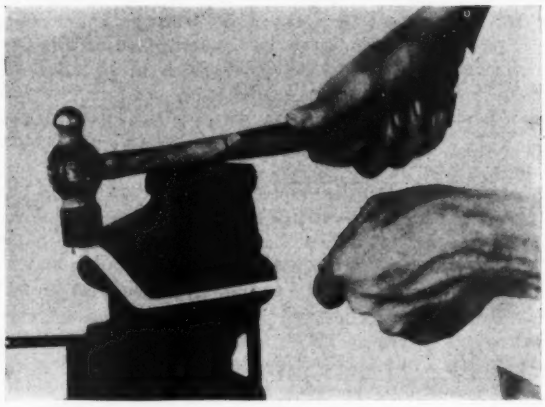


FIG. 7. FORMING THE HOOK.

then work to the edge. (See Fig. 9.) This should spread the rivet. Finish round or flat as desired. A header will be found useful in rounding a head. The top should be absolutely perpendicular to the back after the rivet is set.

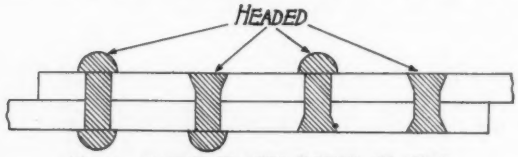


FIG. 8. RIVETS HEADED ROUND OR FLAT.

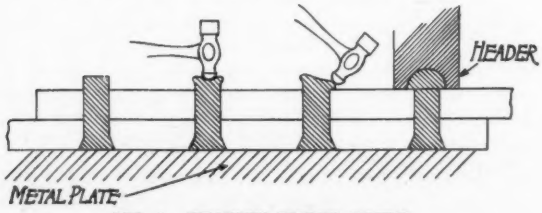
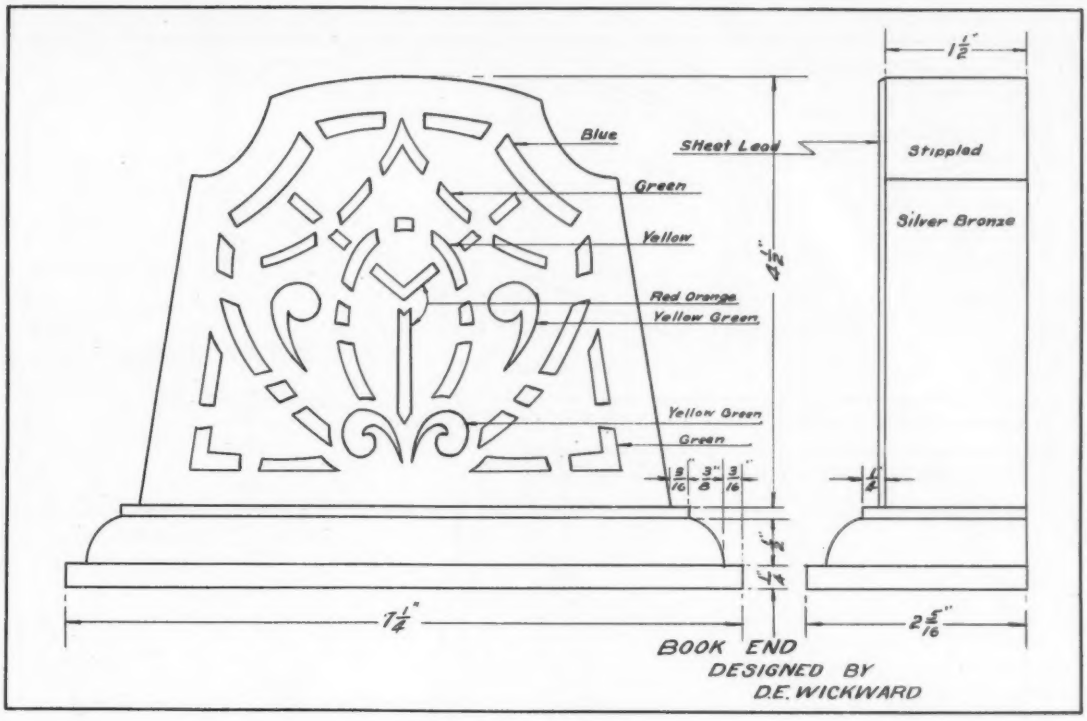


FIG. 9. HEADING RIVETS ROUND.

(7) *Bend and twist the brace.* Bend in the vise and twist with a monkey wrench. Test carefully for correct shape by holding the brace in place.

(8) *Bore hole for bottom rivet.* When you are satis-



DETAILS OF BOOK ENDS.

fied that the brace fits, center punch and bore a hole for the bottom rivet. Countersink as before.

(9) *Set remaining rivets.* Head the rivets round or flat, as desired. A poorly headed rivet should be removed with a punch and a new one inserted.

(10) *Coat the brace with linseed oil.* Linseed oil will protect the brace from rust and will give a finished appearance. A coat of black metal enamel can be used instead of the oil, if desired.

QUESTIONS: (1) Name the different kinds of iron rivets.

(2) What is the use of the countersunk rivet?

(3) Why should you strike the rivet in the center first?

(4) What is a rivet header?

(5) Where are large rivets used?

REFERENCE: Wood & Smith: Prevocational & Industrial Arts, p. 216.

NOTE: The lamp in Fig. 2 is made from No. 20 stove pipe iron, iron rivets, ¼" iron rod, and small pieces of art glass. It is an excellent job in riveting.

LEAD AS A DECORATIVE MATERIAL

D. E. Wickward, Pasadena, Calif.

Not long ago I was asked to try lead as a means of enhancing wooden projects. I did, and found that it worked so successfully and easily that I have the desire to pass the good suggestion along.

BOOK ENDS.

After the article to be decorated is assembled, the finish may be started. If it is to be stained, the finish may be carried to completion; but if it is to be enameled, only the undercoats should be applied. In case there is only one color under the lead, the finish may also be completed. When varied colors are used under the lead, they are applied after the lead design is cut.

The next step, and perhaps the most difficult, is to make a suitable paper pattern or design, which should be in stencil form. When this is cut, the lead should be rolled out on a smooth surface. All unevenness is taken out of it by striking a smooth board placed upon the lead with a mallet. As soon as this is accomplished, the pattern is transferred by tracing around the stencil with a pencil. Two and one-half pound sheet lead, meaning two and one-half pounds to the square foot, is of the right thickness.

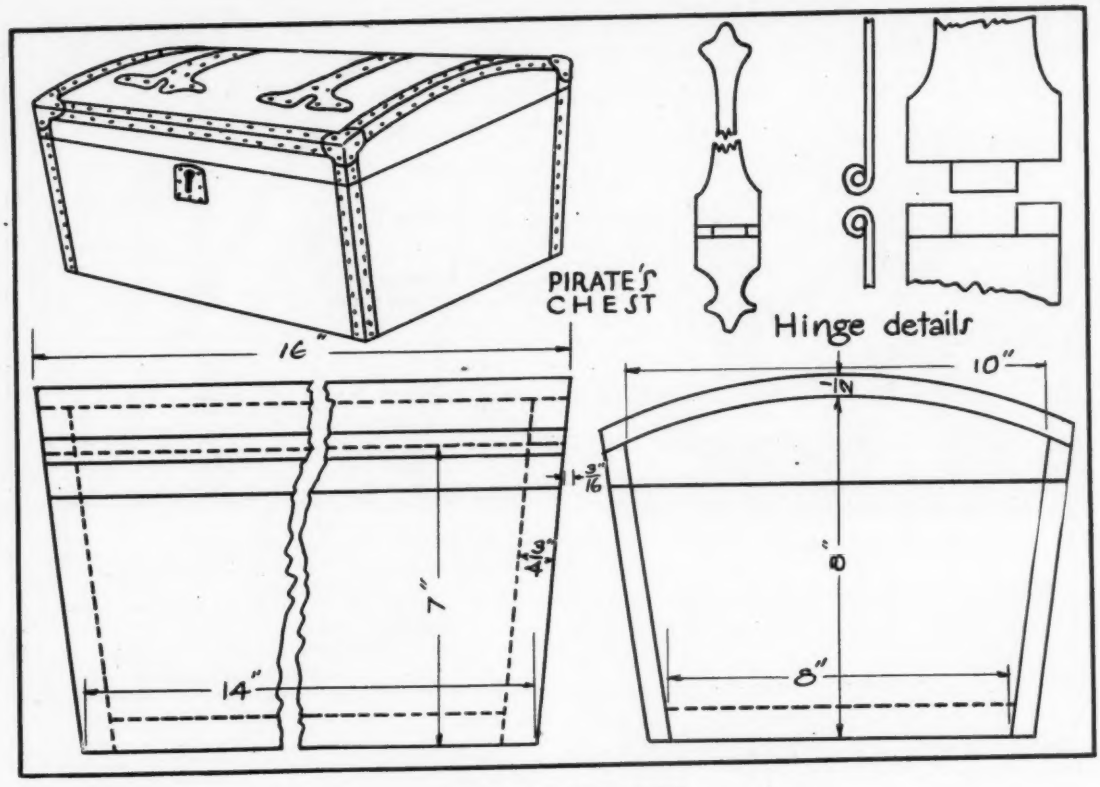
It is advisable to do the cutting on a board which is not highly valued, as it will become knife marked and grimy with lead oxide. The design is cut out with a strong, thin-bladed pocket knife. The cutting should be done in such a manner as to form an outward bevel on the lead, no under cutting. When the cutting is finished, the lead design is made smooth, sanded, and then tacked onto the project with number two gimp tacks, placed in symmetry with the design.

THE PIRATE'S CHEST

E. M. Winterbourne, Denver, Colo.

In the woodworking department of our home mechanics course, it has been somewhat of a problem to find a project which would hold the interest of the boys and, at the same time, teach the processes which we are aiming to teach.

Particularly fortunate has been our experience with the "Pirate's Chest", in an attempt to get away from the abstract presentation of the processes of hinging, lock fitting, wood finishing, etc. The "Pirate's Chest" appeals to the imagination of the boy, as nothing else will. The chest is bound in metal, has a real lock and key, and in



DETAILS OF PIRATE'S CHEST.

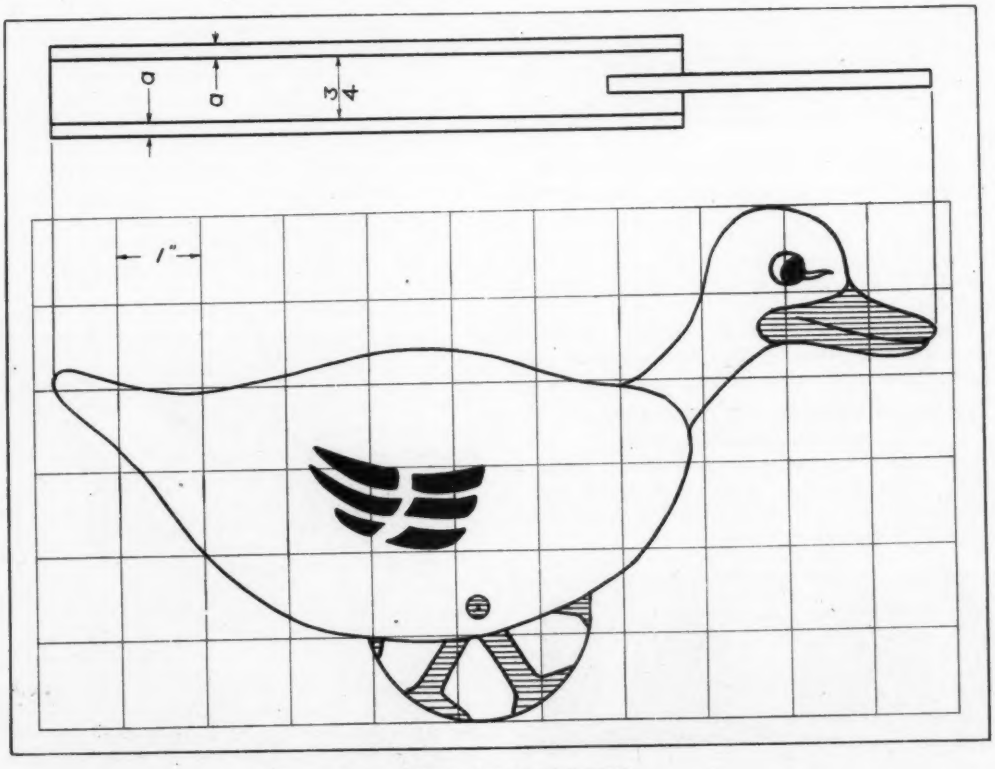


FIG. 1. DETAILS OF A TOY DUCK.

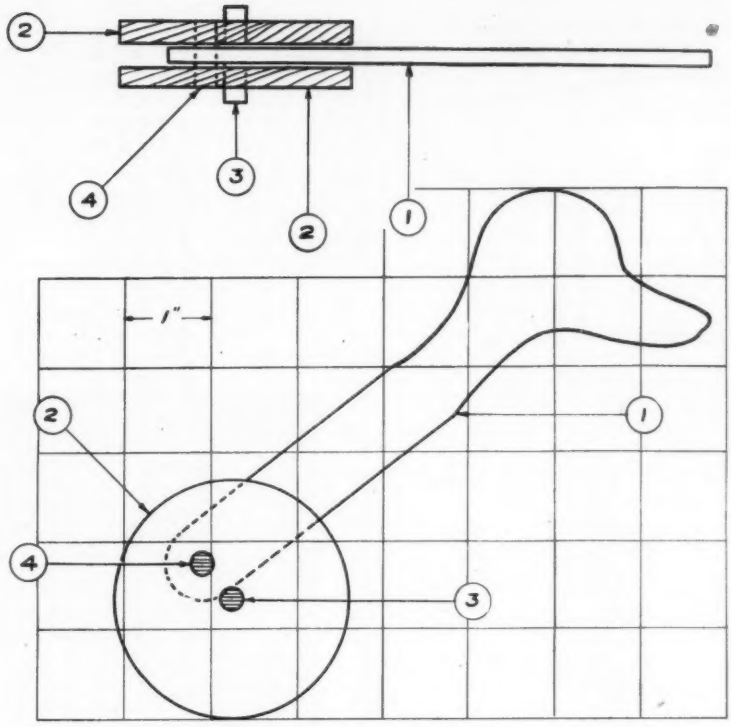


FIG. 2. DETAILS OF A TOY DUCK.

it he may keep his boyish treasures from the prying eyes and fingers of younger brothers and sisters. It makes an excellent Christmas gift.

The processes involved are: cutting pieces to shape with saw and chisel, fastening pieces with nails or screws, hinging, lock fitting, wood finishing, and bending and shaping of light metal. These processes may be presented through demonstrations and process sheets.

Each boy should design his own chest, and decide on sizes, shape, proportion, and decoration. The drawings shown should be only suggestive. Poplar wood has proven to be most suitable for this project, as less trouble is experienced in bending the piece for the top. It is best to shape the ends and sides first, and fasten them together, using a plain butt joint, or a rabbet joint. Next fit the bottom in place, gluing and nailing from the sides and ends. A better construction for this, if time permits, is to groove the bottom into the ends and sides. The top may be made of $\frac{3}{8}$" or $\frac{1}{2}$" material. Steam it or soak it in hot water until it may be bent and fastened into place without danger of splitting. It is better to fasten one side down tightly, and then to pull the top slowly and carefully into place with the hand screws, or by tying heavy cords around the chest, and tighten by twisting the cords with a stick. After the parts of the chest have been all fastened together, it must be carefully marked out and sawed apart, the top part forming the lid.

Any of the conventional methods of wood finishing may be used, but the problem is more interesting if a finish is used which will give an antique appearance.

Copper, brass, or sheet iron may be used for binding the corners. It may be fastened in place with brass escutcheon pins spaced about an inch apart. For the hinges, use brass or copper ornamental surface hinges; or butt hinges may be used and ornamental hinge tails may be cut from copper or brass or iron, and fastened in place with the escutcheon pins. The designing and making of the entire hinge makes an excellent problem in metal work.

A TOY DUCK

Margaret Fullerton

Everyone likes toys which will go. Not only are they more fun to play with when finished, but it is more fascinating to put them together. This duck involves practically the same processes as all jig saw cutouts, but instead of standing still on a base, it patters along on its feet and stretches its neck in and out like a real duck.

The sides of a cigar box will be suitable material for a'—a' in Figure 1. The same or $\frac{1}{4}$" material may be used in the other parts. Cut one head, two circles, and two bodies. To make these exactly match and to save extra cutting, glue two pieces of board together with stiff cardboard between them; cut them with one sawing, and split the cardboard apart, sanding or soaking off any parts which may adhere to the wood. To prevent the crack which will appear along the back of the duck when viewed from above, cut a third body part from a $\frac{3}{4}$" board to extend from the back of the neck, across the back and around to the wheel. Cut away most of the underside of this to allow plenty of room for the action of neck and wheels.

After being sanded smooth, the parts are assembled and painted. Apply one or two coats of flat white paint and allow to dry. Smooth off any specks or bubbles and apply a coat of enamel. This may be gray, buff, or light brown. If you do not have the exact color you wish, use white enamel as a base and color it with ordinary tube oil paint or with color ground in oil such as is used by house painters. A little black with the white will make gray; a small amount of orange with a bit of black will make buff; and a larger amount of orange and black will make varying tints of brown, according to the proportion of white base and coloring. When the background has dried, draw in the bill, eyes, feet, and wings. The bill and feet will be painted orange-yellow. These will be more decorative if outlined in dark or brown. The eyes are black and yellow with red in the corners and the wings are brown.

If house paint or other oil paint is used instead of the enamel, a final coat of white shellac will give the surfaces an enamel-like finish.

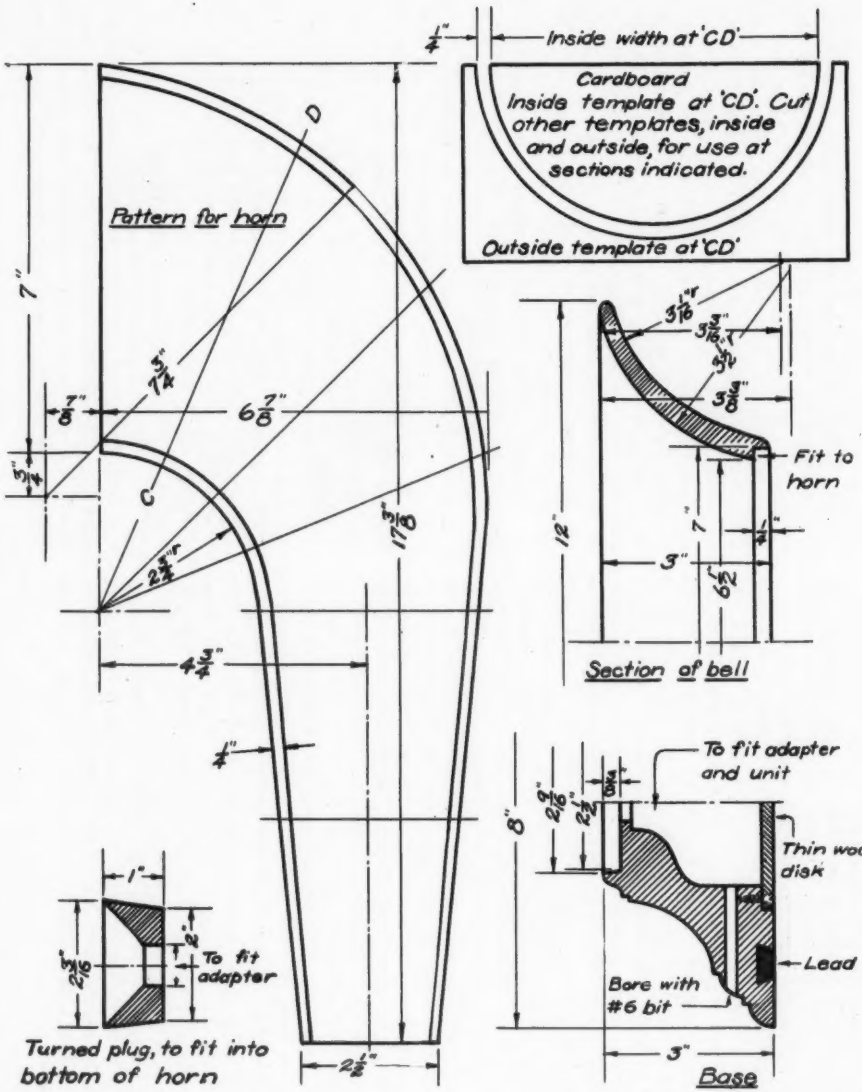
Assemble the parts as is shown in Figure 2. The neck (1) is fastened to each of the wheels (2) by a dowel rod (4) which does not go through the center of the wheel. Two other dowel rods (3) fasten the centers of the wheels to the body. As the wheels go around, the dowel rod (4) carries the end of the neck in a circle and moves the duck's head in and out. As the wheels revolve, the feet give the appearance of walking. The third body piece is glued in place before the last part of the body is put on. A wooden pin just below the neck gives it a bar to rest upon, and makes a good place on which to tie the string by which the duck is pulled.

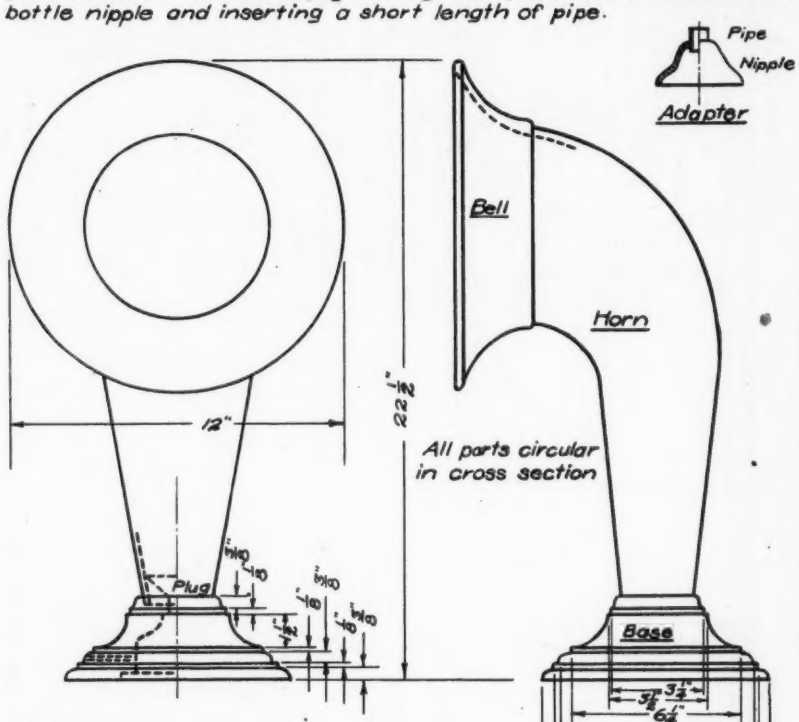
RADIO LOUD SPEAKER

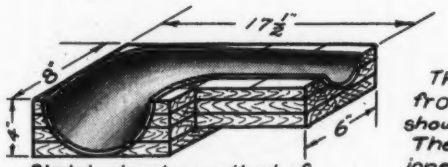
H. L. Weatherby, Montgomery, Ala.

In this day of the vogue of radio, when every boy aspires to become the owner of one of the "super extradyne" sets with loud speaker attached, the drawings for the construction of a radio horn, that is not too difficult

Materials needed:- About 25 board feet, spruce or other suitable wood. A Loud Speaker unit. A special adapter, or one improvised as shown in sketch, by cutting the tip end off of a wide mouth bottle nipple and inserting a short length of pipe.


Inside width at 'CD'
Cardboard
Inside template at 'CD'. Cut other templates, inside and outside, for use at sections indicated.
Outside template at 'CD'
Pattern for horn
Fit to horn
Section of bell
To fit adapter and unit
Thin wood disk
Lead
Bore with #6 bit
Base
To fit adapter
Turned plug, to fit into bottom of horn





Sketch, showing method of gluing, and cutting away inside portion of horn. The cross lines on the face indicate template sections.

The base and bell must be turned from both sides, therefore care should be exercised in centering. The inside of the base should be cushioned with a lining of felt to protect unit.

DETAILS OF RADIO LOUD SPEAKER.

for the average upper class high school boy to construct, may not come amiss.

The only requirements are a reasonable skill in the handling of tools and considerable patience. The drawings and photographs taken together will explain the construction and make the laying out a rather simple matter.

The horn and bell should be made from some thoroughly seasoned, close-grained, light, soft and easily manipulated wood, preferably spruce, of course, due to its quality of resonance. The base may be made of other and heavier wood and should be loaded.

The first step in construction will be the selecting and gluing up of material into the general shape of the horn as shown in the sketch. This will probably require several gluings and must be very carefully done as the success of the undertaking depends on the careful preparation of the wood and subsequent gluing. The horn portion should be glued up in two sections to permit the cutting out of the interior.

RADIO LOUD SPEAKER.

The next step will be the laying and cutting out of a series of inside and outside semicircular templates, and a pattern for the outside shape of the horn as shown in the sheet of details. With these cardboard layouts prepared and the gluing completed we are now ready for the shaping of the horn. Place the horn pattern on the top or inside surface of each glued-up section, as shown in the sketch and mark around it. Now draw a line, ¼" inside of this line, all around, marking the inside of the horn or the portion to be removed. Then with gouges, round scraper and sandpaper cut out and smooth down the inner surface to templated form.

When this is done on both pieces, saw to the outside line, using either a band saw or a hand-turning saw. Glue the two sections together, being very careful that they fit and that they do not slip in clamping. After the glue has set, any irregularities at the joint may be smoothed out with a scraper and sandpaper. Next shape up and form the outside of the horn to the outside templates, using spoke shave, block plane, scraper, file and sandpaper.

After this is done, the horn may be laid aside and the bell turned from either a solid piece of wood, or from glued-up pieces forming a block 3"x12"x12". This must be turned to make an accurate fit with the large end of the horn as shown in the details. Glue this bell to the mouth of the horn and after it has set, shape the joint edge to conform to the throat of the horn, using file and sandpaper. If this is carefully done, the change from bell to horn cannot be detected on the inside, but for the change in grain.

Now turn a plug, as shown, to fit into the inside bottom end of the horn and with a hole of suitable size to fit the short length of pipe in the adapter. Glue this into place.

Before turning the base, purchase a loud speaker unit and either make or buy an adapter. Turn the inside of the base to fit these and line with felt to protect the unit. After turning the outside of the base glue it onto the horn.

Saw or turn a circular disk from thin wood, to hold the unit in place. Provide a cushion for the unit by gluing several small circular layers of felt on the top side of disk. Fasten this piece in place with screws. Bore a ⅜" hole as a wire outlet near the bottom of the base.

The inside of the speaker is roomy enough to permit cleaning up, preparatory to finishing, so the next step is a preliminary sanding both inside and out, and then the desired finish is applied.

The speaker illustrated was finished in ivory enamel to match the radio cabinet and other furniture in the room. Its tone has none of the undesirable "tinpanny" effects found in metal loud speakers and when equipped with a good unit is the equal of the high priced loud speakers at a fraction of the cost, not only in tone but in appearance. It will do credit to any radio set.

QUANTITY AND QUALITY IN DRAWING ROOMS

Laurence Parker, Pittsburg, Kansas

During the war it was my pleasure to be shown through a factory which was manufacturing cartridge-making machinery and other important war materials. As we went through the plant I was amazed at the accuracy, the skill and the enthusiasm of those who operated the machines turning out the products.

Finally the superintendent, who was showing me through, conducted me through double doors into the designing and drafting department. Here all was quiet. There was none of the hum of the factory or the rush for output. One man was at work at his board. Two were engrossed over a newspaper and from their absorption it was safe to assume that they were not reading anything connected with the job. One was star gazing, and may have been battling in his mind as to proper proportion of some machine part. The remaining three young men were visiting in a jolly sort of way. Of course, after our presence became known things settled down into a more industrious routine.

As we left the room, the superintendent said, "Did you ever see such a bunch of loafers and at a time like this? And the worst of it is that their parents paid good money to have them trained to be drafting room loafers during their high school and college courses."

At the time the remarks of this superintendent seemed a trifle strong, but ever since I have watched the work of boys and men in high school and college drafting rooms from a new angle—the angle of production and output. For after all, the tracer, detailer or designer is paid for what it is hoped he will produce.

As a result of these remarks I have made it a habit to inquire of the student as I see the latter at work on a drawing or a drawing plate, "How long have you been working on this job?" You would be surprised to see the way he gropes and guesses he has been two days, or three weeks, etc. Only once has a student told me promptly the number of hours. His instructor so promptly corrected him, and then revised his correction, that I am sure both were guessing. In order to complete the questioning I have tried to find out from the instructor how long the job should take. The usual answers are: "A boy has to finish 21 plates in the semester to pass." "Really, I don't know." "Boys differ so that it's impossible to tell." "We don't believe in hurrying the boys for we want perfect work." "We are not trying to train these boys to be draftsmen; we are stimulating their powers of

visualization." None of these are real answers for, without exception, the instructors questioned have never thought of securing the maximum quantity of production of drafting along with quality.

Twenty-one plates in a semester may be an impossibility for me, it may be a mere child's play for the man next to me, while for an occasional man it may exactly fit. It's a safe guess that 21 was hit upon because all but the laziest could complete that number.

We can see no reason why a boy should not have his powers of visualization stimulated and strengthened by increased output. We believe that quantity and quality can go hand in hand. We believe that until they do go hand in hand, that a real habit of industry will not be planted in the boys and men who take drafting in our high schools and colleges.

How can quantity be stimulated without sacrificing quality? We must go to industry for suggestions and here is one borrowed from manufacturing procedure.

When the learner is given a plate to do, an object to draw, or a detail drawing or tracing to make there should be a standard time set for this job. A rubber stamp similar to this form should be stamped in one corner of the drawing.

The standard time is filled in before the learner starts work. This time is similar to "bogie" in golf and means that the student must be exceptional to reach it. It may be based upon the actual time required by the instructor to do the job. This time, plus a reasonable percentage, would be standard time. It may be based upon his estimate of the time he would require.

Right away we have introduced competition and made a game of the job. Doubtless standard time for drawing jobs would be revised considerably at first. Some of these red-blooded youths would set out to beat standard time and would astonish themselves and others.

Standard Job No. _____

Standard Time _____ hrs.

Date _____ _____ hrs.

_____ _____ hrs.

_____ _____ hrs.

_____ _____ hrs.

_____ _____ hrs.

_____ _____ hrs.

_____ _____ hrs.

_____ _____ hrs.

Total _____ hrs.

A grade of ____ % has been allowed upon this drawing based upon time taken and quality of drawing.

FIG. 1.

TIME REQUIRED ON DRAFTING JOBS

	Job Numbers									
	1	2	3	4	5	6	7	8	9	10
Std. Time in Hours	4	9	6	3	12	10	32	8	1	4
Fred Smith	8	12	6	4	11			10	1½	5
George King	5	14	7	3			40			
Etc.										

FIG. 2.

As the student worked he would keep track of his time spent upon the job. If he had worth-while stuff in him this daily addition of time spent would be a spur to more effective effort. Less time would be spent day dreaming and on excursions to the drinking fountain.

As a further stimulant, a chart something like the following form could be posted in the drafting room.

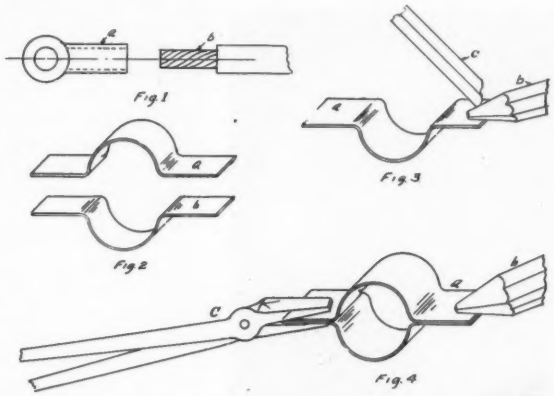
During a vacation period I worked in the Ford Motor Company plant in Detroit. No one ever told us to hurry or to keep busy—but we did keep busy and the weekly output record upon each cold heading machine we were tending was a constant encouragement to us to keep busy in an intelligent way in order to maintain output.

If such methods work so well in industry, an adaptation of such methods should work equally well in this educational factory where we are turning out a product of well finished young manhood and womanhood. Let us see to it that they do not lack in industry and that such complaints of our output as those quoted at the opening of this article are without foundation.

THE RIGHT WAY TO SOLDER—TINNING

C. C. Hermann, Moline, Ill.

Tinning, in soldering work, consists in spreading a very thin layer of solder over the surfaces of the work to be united. This is one of the important phases of soldering and should be well understood before going very far with soldering. Tinning is used in all copper bit work and quite frequently in connection with blow torch work. Practically all flat work is tinned before secured by soldering, and frequently copper wires or wire cores are tinned before inserting in their terminals. An example of the latter method is shown in Fig. 1, in which "a" is the copper terminal and "b" the stranded wire. A pot of molten solder is kept near at hand and the scraped end of the wire placed therein for just an instant. As soon



as it is withdrawn it is wiped off with a canvas pad thoroughly tinning the wires. Next, the terminal is stood on end and heated by means of a gas flame. As soon as this has reached the desired temperature, a small amount of the solder is poured into it, completely filling the terminal. Now the wire is thrust into the terminal, leaving the surplus solder fall to the work bench. As soon as cooled, it will be found that the work is thoroughly and neatly finished. The terminal can be heated in one of any number of ways, although the gas flame method is faster, and a number of the terminals may be stood up in a row for heating.

Another method of making the soldered terminal is to simply clean the wire, heat the terminal, and when brought up to the proper temperature, thrust a piece of wire solder therein. The wire solder melts readily, and while in a molten state, thrust the end of the wire into the terminal. If the wire has been thoroughly cleaned by fluxing it with chloride of zinc, the work will be found to be tight. In wiping the wire, use a small amount of tallow on the wiping cloth.

When tinning flat joints, seam work and other classes of work of similar nature be sure there are no lumps or rough places. It is good practice to wipe such work while the solder is fluid. In this way all surplus solder forming lumps and rough places would be removed. The idea is to obtain just a very thin coat of solder on the work, the thinner the better.

An example of flat work is shown in Fig. 2, which shows two flat pieces "a" and "b" to be united on the flat portion indicated by dotted lines. In Fig. 3 is shown the work at "a", the soldering bit at "b", and the solder stick at "c". A very small amount of the solder is applied to the bit and this is rubbed over the work, which has previously been fluxed. The bit heats the work to the proper temperature by contact and the solder sticks. As soon as sufficient solder is on the bit the solder stick is

removed. The work is then wiped with a wiping pad previously touched up with some tallow.

As soon as all four parts have been tinned in this manner, they are laid upon each other in their proper position and the bit applied as shown in Fig. 4. The pieces are held by the tongs "c" by one hand, while the heated bit is applied with the right hand as shown at "b". The work is thus heated and held together by the bit, until the tongs can be transferred from the lips "a" to the lips "d". The bit is then removed and the work held by the tongs until secured. It will be noticed that no solder is added in this operation since this is a form of sweating the pieces together.

Before placing pieces of work together for sweating, examine them closely for spots not covered by the solder. These may be very small pin holes, but when the work is sweated they will enlarge so that the joint will not be tight. Such spots result from not having the work clean. Practically all metals tarnish when exposed to the atmosphere. This is oxidation and must be removed if the work is to be thorough. The solder will not stick to the tarnished spots and quite often, although the spot is no larger than a pin head, it will affect quite a large area of the joint expanding during the heating process due to a gas forming between the solder and the work. Be absolutely sure that the metal is clean by scraping and applying flux.

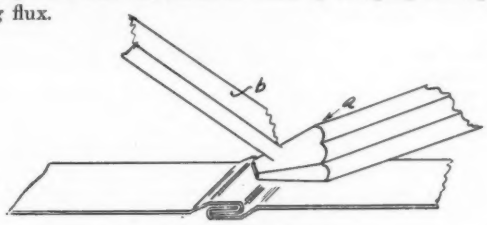


Fig. 5

Seam soldering is a difficult piece of work to do and have a workmanshiplike job when completed. Practice, however, will make perfect. Take, for example, the seam shown in Fig. 5. The work we will assume is cleaned and locked together ready for the solder. The bit is heated and held with the point on the seam as shown at "a". The solder stick is held against the end of the bit as shown at "b", from time to time depending upon the amount of solder required to complete the work. The bit is then moved back and forth with the point in the solder. As the work is heated, the solder is drawn up into the seam, at the same time leaving the edge of the seam neat and without an excess of solder. The opposite side may be soldered in the same manner. Usually more solder is applied to the bit than actually required at any one spot and this surplus is worked along the seam. The bit, of course, must be kept hot by returning to the fire occasionally. This kind of work requires two or more bits so that the work will not cool off while waiting for the bit to heat. Chloride of zinc is applied to the joint as the work advances.

Another form of soldering is used quite extensively in electrical work in connection with wire joints or splices. After the joint has been completed by twisting the wires together a pot of solder is heated. A second pot is placed below the joint. As soon as the solder is melted and heated to the proper temperature it is poured over the joint. Keep pouring the solder until it has washed away all dirt from the joint and sufficient solder sticks to cover the joint well. Now wipe the joint with a wiping pad well soaked with tallow, which removes all surplus solder and completes the work. The joint will be found to have a very neat and secure appearance.

Sweating is a term used to indicate a type of soldering used generally in temporary work. The term was applied in a previous paragraph and when completed as shown makes a very good permanent job. Exactly, however, sweating indicates a form of soldering in which no bit is used. In this way the pieces to be united are first tinned thoroughly. The pieces are then held together and heated until the solder melts. When cooled the pieces are held together by the solder.

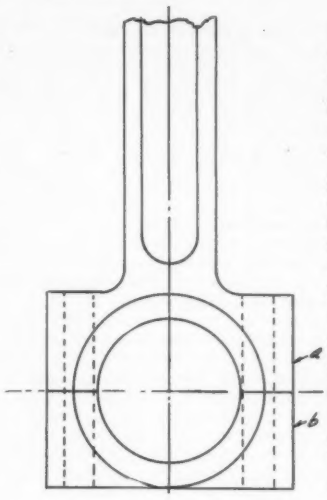


Fig. 6

This latter operation is applied quite often in connection with machining certain parts, as for example, boring out the connecting rod to receive the bearing as shown in Fig. 6. The pieces "a" and "b" are first heated in a forge and when hot, fluxed with borax, and tinned similar to the method explained in a previous article for tinning the bit. The pieces are then placed together and clamped after which they are again heated and allowed to cool. They are then held together by the solder until the machining is completed, after which they are again separated by heating to melt the solder.

Bearing liners are often sweated together by this method and not infrequently sweated to one-half of the bearing. In this manner they are easily held in position until the work is completed, without the trouble of working with loose liners.

Soldering has many applications and the foregoing will serve to illustrate a few of the more common forms. Others will readily suggest themselves, however, as the work at hand will often require slight changes in method to suit conditions.

CHANGES AMONG INDIANA VOCATIONAL DIRECTORS

Cornelius Abbott has resigned as vocational director at Columbus to accept the directorship of the Mishawaka schools left vacant by Allen L. Shank. Mr. Abbott's splendid work at Columbus was directly responsible for his offer of the Mishawaka position at a nice increase in salary.

Mr. Shank left Mishawaka to become principal of the Lathrop Trade School at Kansas City, Missouri.

Clarence D. Rotruck has been advanced to the position of vocational director of the Anderson schools. He succeeded H. W. Roberts, who resigned to accept an industrial position. Mr. Rotruck has been doing vocational teaching in the Anderson schools for the past year and has well deserved this promotion.

G. H. Nicholas has been appointed vocational director of the Richmond schools. Mr. Nicholas was formerly a teacher of industrial work at Richmond, but has recently been in the University of Wisconsin where he completed his degree. His appointment is a splendid recognition of his ability in the field of industrial education.

Mr. Emerson W. Manzer, formerly with the Wisconsin High School of the University of Wisconsin, is now connected with the John Burroughs School at Clayton, Mo. Mr. Manzer is organizing the art and manual arts department. The school is of the experimental type and is provided with a complete Oliver equipment.

Mr. Thomas S. Rees, director of the Racine, Wis., vocational school, is confined in a Milwaukee hospital where he is recuperating from gunshot wounds received while hunting late in September.

Mr. J. E. Retherford, formerly a member of the faculty of the Idaho Technical Institute, Pocatello, has been elected president by unanimous vote of the state board of education.

Mr. Retherford was born in Indiana and received his education in the Indiana Normal School at Terre Haute, and in the State University. He also completed special work for a master's degree at the University of Chicago.

Mr. Retherford came west in 1903 as head of the social sciences and history department of the Ogden, Utah, high school, and later became head of a similar department at the Pocatello Institute. In 1915 he was made registrar, and in 1920 he became dean of the faculty. He was acting president of the school in 1924 during the illness of the former president, C. R. Frasier, and again following his resignation in June last.

INDUSTRIAL-ARTS ROUND TABLE

A genial group of men gathered at the Central Continuation School, in Chicago, on Friday, October 23rd, to inspect an exhibit of general shop work and later discuss the topic: "The Shop Teacher's Opportunity to Counsel Students on Their Careers."

Mr. H. C. Taylor, head of the Manual Training Department in the Oak Park and River Forest Township High Schools, led in the discussion by pointing out specific instances where students with swollen expense allowances had been made to realize the real seriousness of using walnut when a cheaper material would have served equally well. This thoughtless tendency was evident also in careless use of time, and even members of teams placed the result of important games in doubt by failing to hand in work on time. It is also true that boys interested in good records and remaining on the honor roll frequently complain that certain teachers spend too much time telling stories. It would be well, Mr. Taylor concluded, to ask, "What are you doing in your daily work to encourage a boy in meeting the problem of selecting a career field?"

Mr. E. E. Sheldon, chairman of the round table, asked, "What can the schools do to teach absolute responsibility?" Some men notably successful in business grade the boys by how well they finish a task rather than by age, or length of service. A boy should not be trusted with more than twenty-five dollars when sent on an errand, and the parent of a boy who was careless in using the company pencils had finally to be told, "Take your boy with you—he is your product." Why not try to develop the attitude toward small and personal things like that toward larger and evidently valuable things? A large company makes no provision for locks on the lockers. A final test of a young man beginning a career is—to note if he is satisfied with a lower standard of work and pay, when by accepting a little more responsibility and working a little more, he could improve both his wages and his future conditions of employment. The problem is deeper than simply the relations or adjustments between the shop man and his employer.

Mr. Urban Willis, Director of the Pullman Free School of Manual Training, insisted that there must be a mutual understanding between teacher and pupils. He named seven points:

1. Teachers and pupils on time.
2. Appearance around their places of work, proper care of tools and the 100 per cent replacement of items loaned from supply rooms.
3. Work in on a time basis.
4. Finishing a job even if the boy's interests change.
5. Rotation around the shop to avoid too early specialization and to develop balance.
6. Accurate and neat accounting for all supplies.
7. Pay for material to be taken home before working on it—no debts.

A career develops and means day by day work like a building develops. The teacher himself is more responsible and influential than anyone else in the system. When work is assigned, it is fatal to fail to check it up. There is an unconscious development toward the great goal—meeting the work of a man like a man. Practice in school will not bring the boy to a career unless the boy meets the daily task.

And so round the table went the word. Some 44 men took part and it would be delightful to name all the men who quickly stood up and read a telegram or a night letter within the three minutes allotted. Quite a bit of fun was had at the teacher who stands at a station or in a corner. Mechanics are called "journeymen." The teachers must do likewise. Student government works in other departments of the school—why not in the shop? The shops have little problems in discipline—did the teacher use good judgment in the accuracy his own demonstration showed necessary? By preliminary estimates, a teacher can develop a judgment which may become more and more accurate as the boy progresses in his career experiences. In spite of long hours and the regular responsibilities, time spent after school with boys in the shop for make-up, for extra work, or for any other purpose gives the teacher a measure of the load the boy is able to bear and real teaching will keep the boy in line with the rest.

The round table is fortunate in having among its members men who are employees of large companies and some who are in personal work. We are to hear soon from Mr. John Steendahl, who is Personnel Director for the Benjamin Electric Company of Chicago. Mr. F. M. Pepper of the Illinois Bell Telephone Company stationed at Joliet, is another enthusiastic member and can give anyone pointers on cooperation with industry. These men are keen on reading and under the chairmanship of Mr. Leonard W. Wahlstrom, of the Francis W. Parker High School, Chicago, a list of readings is to be compiled.

Mr. Lester E. Smith, of the Chicago Latin School, told of how activties outside the schoolroom frequently focus attention on a situation where a boy needs help and counsel. Make the boy handle the money for the school paper and account for every penny with a daily check on the accounts. Mr. Smith is quite well known for his regattas in Lincoln Park and for developing in his boys the ability to sail some of the yachts in the North Side harbor.

The secretary would like to add to the mailing list the name of any man in the Chicago District interested in a discussion of shop subjects. The next meeting is at Pullman, on December 4th. A trip through the shops will precede the meeting.—Robt. B. Bagby, Secretary.

BOSTON SOCIETY HOLDS FIRST MEETING

New Officers in Charge—Mr. Newell Discusses Aesthetic Backgrounds

The Vocational Education Society of Boston met for its first meeting of the school year Saturday, Oct. 17, at Healy's Hotel, Washington Street near Essex. This location, it may be worth noting, was famed in old Boston as the site of the "Liberty Tree" of pre-Revolutionary days.

About fifty members sat down to dinner and to informal conversation. At the close of the meal the retiring president, Daniel H. Shay, called the meeting to order and embarked on the business program. Reports of officers and committees were made and accepted. The state of the Society, in both membership and finances, was shown to be very vigorous.

Mr. Shay, in a speech of introduction, then turned over the reins of office to the new president, Mr. Robert H. Baker, Division Head of the Machine Shop work at Boston Trade School. The membership gave a vote of thanks to the retiring officers; President Baker outlined briefly his policies, and then introduced the speaker of the day, Mr. C. Edward Newell, director of manual arts of the Boston schools, who recently came to that position from similar work in Springfield.

Mr. Newell's topic was "Our Aesthetic Background." At the outset, he disabused his hearers of the common but erroneous idea that art and utility bear any necessary opposition to each other. All those present, he said, were engaged in the common work of helping boys and girls to find themselves, both vocationally and avocationally; and the aesthetic background should underlie the work of the shop as well as that of the studio.

The earliest races of man gave unmistakable attention to spiritually satisfying values in even the most utilitarian of the crude implements which they fashioned. Beauty and utility were inseparable, as they always should be. Art teachers today realize that they must possess an understanding of utilitarian features; that real art is not a thing which can be "tacked on" to something of which it is not an integral part. Shop teachers in every craft should keep the same truth in mind in all the work they do. There is no mechanical trade, averred Mr. Newell, in which the aesthetic background is not worthy of emphasis—indeed, of far more emphasis than it is commonly given.

Mr. Newell illustrated his point with lantern slides, and with actual objects loaned by the Boston Art Museum and brought to the place of meeting. He illustrated various periods of decorative design in furniture and woodwork, from the straight, heavy lines of the fifteenth century down to the present time, and explained the characteristic features of use which determined the form. In this connection, the speaker stated his belief that it is inadvisable to attempt to familiarize pupils with too many period styles, such attempts being doomed in most cases to result in mere confusion. It is of value, however, he stated, to make pupils acquainted with the distinctive features, including foliage of the trees from which our woods come; and this leads by an easy step to an inculcation of an appreciation of "art in nature," which is not foreign to the manual training field any more than it is to the field of the painter's art, as exemplified so well by those tree-lovers, Corot and Inness.

Historic examples of work in stone, cement, and various kinds of metal were also shown by Mr. Newell, who dwelt upon the relation which such things bear to our

modern industries. A few "horrible examples"—principally of modern origin—were exhibited by way of contrast.

The wide field for the application of principles of correct and pleasing design which is offered by the printing craft came in for special attention on the part of the speaker. He gave an interesting discussion of margins and tone-values which was fully as revealing and helpful to the printers among the audience as it was to those whose work does not bring them into contact with the "art preservative."

In concluding, Mr. Newell expressed a hope that the Boston Art Museum may permit items from its valuable and extensive collection to be formed into a traveling exhibit of historic craftsmanship, which can be placed on display in the schools whose pupils are to be the craftsmen of the future.—Frederick Ames Coates.

THE SCHOOL CRAFTS CLUB MEETING

First Session for 1925-26

Dr. J. Carleton Bell addressed the School Crafts Club of New York and New Jersey, at the first autumn meeting, held on Saturday evening, October 17, 1925, at the Ethical Culture School, New York City. Dr. Bell, as a member of the faculty of City College, is in a position to tell some vital things affecting methods of teaching. He was one of the founders of the New York Society for the Experimental Study of Education, and is Editor of the volume, "Contributions to Education."

Dr. Bell enlarged upon the subject, "Experimental Education and its Probable Effect upon Industrial Arts Education." His discussion took up the origin and development of experimental education, current tendencies in experimental education, and questions bearing on industrial arts in experimental education.

Many speak of experimental education as originating in America, and as being a veritable craze on this side of the Atlantic. However, the roots go back to European soil. First, about fifty years ago, in Germany came the rise of experimental psychology. Before 1878 there was no science to the study of psychology. At that time Wilhelm Weindt decided that it would be profitable to apply some science to this study. He opened a laboratory in the University of Berlin, where he made investigations as to how we see, hear, feel, will, etc. A pupil of his, Nieumann, worked upon sense perception. In his lectures to teachers he applied his discoveries to education and wrote a book on Experimental Pedagogy. This work had a tremendous influence in America. In 1915 he got out a second edition of 2,250 pages, which was a sort of educational encyclopedia. Another German, Stern, originated the study of applied psychology.

Alfred Binet, born in France in 1857, and later a student in Paris, contributed much to experimental education. He established a laboratory in Paris, in 1894, to study individual difference factors. He worked on tests to bring out points of difference, and in 1905 became associated with a school for mental deficients. His tests were devised to sift out children of lower intelligence. In 1908, a revision was brought out following a try-out of three years, and these are now a standard for determining mental age. The intelligence quotient idea, however, must be traced back to a German, Stern. The Stanford Revision of Binet tests have had a great sweep in this country.

England contributed less than Germany and France. Galton pursued studies in imagination, background of consciousness, and differences in people. Pierson applied refined mathematical methods to the study of life phenomena. Followers of the latter have considerable influence, such as Spearman; and Burt, who was educational specialist for the London County Council.

In America, G. Stanley Hall developed some remarkable students in experimental education. Dewey, later of Columbia, was one of his students. Catell, in 1895, worked out some tests to rate the ablities of freshmen. The most prominent among our American scholars interested in experimental education is Thorndike, who at the start of his career, studied animals.

Tests have aided in getting the proper reactions from pupils. However, the Binet tests took too long with large classes. During the war the Alpha group tests were developed by psychologists. It has been substantiated that intelligence is made up of a group of qualities, with individuals strong in one and weak in others, etc. We now have tests dealing with problems of the curriculum and stressing story telling, handwork, and play.

Dr. Bell believes that industrial arts are a basic cornerstone for any theory of education. He read a recent article from a front page of the London Times. This was the beginning of a series to get industrial arts before the English public, stressing the aim of stimulating thought and appreciation of industry. In America, we have developed the Stenquist tests for mechanical aptitude as against verbal. However, when these tests were tried out with 12,000 in the army the results were not successful. Toops has arranged some trade tests. There are problems pertaining to experimental education which should be solved:

1. Comparison of pupils in academic and industrial arts subjects for individual abilities.
2. How do pupils who do well in industrial arts compare in academic subjects?
3. To what extent are the Stenquist picture tests applicable?
4. Is it not possible to design a more sensitive instrument to show the degree of success attained through a job analysis of the activities involved?
5. What value is there in rating pupils in interest, attitude, and initiative?
6. What are the problems of industrial arts teaching that experimental studies in education may aid in solving?

The following were accepted as new members of the School Crafts Club: Harold Feurstein, Princeton, N. J.; Philip F. Roden, Jersey City, N. J.; and Edwin J. Salmon, Jersey City, N. J. A vote was registered dropping the December meeting of the Club due to its proximity to the Christmas holidays. President Frederick C. Arnold announced that the next meeting of the Club at Geneva Cafe, on November 21st, the program to include speakers who would deal with problems of school management. Ex-Presidents Judd, Cochran, and Wagner, serving as a nominating committee, brought forward a slate of officers and committees for the coming year. The report was accepted and the personnel elected to office unanimously. Charles H. Kennington of Newark, N. J., will serve as president.

Three round-table discussions proved interesting and helpful. Mr. Thomas Darling led a discussion on "The Boat Model." Mr. Darling had a model for exhibition in explaining the process of making the boat. This problem has a strong appeal for boys and it is possible to teach correlations such as science, commerce, transportation, ship-building, pattern making, moulding, and metal-work. Mr. Louis Taylor led a discussion on "Mechanical Drawing Methods." Subjects such as aims, supplies, care of instruments, ventilation, pupil communication, and course of study were discussed. Mr. Albert N. Petterson explained to another group the fine points of a system he has developed by means of cards and a chart, for keeping track of teaching material. He teaches a lesson to a class every time they come and by means of his card system is able to keep the instruction flexible enough to function according to the needs of the pupils. He uses pupils to follow up his instruction to make sure that it gets over to all members of the class.—Lloyd F. Stair.

INDIANA SOCIETY FOR VOCATIONAL EDUCATION

Denman Kelley, State Supervisor of Industrial Education for Indiana

The Indiana Society for Vocational Education held its annual meetings at Indianapolis Thursday and Friday, October 22-23, in connection with the Indiana State Teachers' Association.

Dr. Otis Caldwell of Teachers College, Columbia University, addressed the Thursday morning session at the Claypool Hotel Assembly Room.

Dr. W. W. Patty of Indiana University was the other speaker at the morning session.

In the afternoon sectional meetings were held. The speakers before the Industrial Section were Professor M. L. Laubach and Professor George K. Wells of the Industrial Education Department, Indiana State Normal School at Terre Haute. The meeting then broke up into subsectional meetings for auto-mechanics, drafting, electricity, metal work, and printing teachers.

An evening dinner for members and friends of the Society was held at the Y. M. C. A. One feature of the entertainment was the radio program of songs and catchy radiograms directed by Harry E. Wood, vocational director of the Indianapolis schools. Behind an artistically printed mammoth radio panel the various performers did their "stunts" which "brought down the house" more than once.

After the dinner Dr. Caldwell made his second address before the Society.

Friday morning the vocational directors of the State met for informal discussion at their annual breakfast at the Y. M. C. A.

The attendance this year was the largest since the Society was organized. Some of the sub-sectional industrial meetings which have formerly had an attendance of eight or ten drew such a crowd of enthusiastic teachers that the rooms would not accommodate them. If the number of people, the addresses, and the enthusiasm displayed are any indication, industrial education in Indiana is in a very healthy state of progress.

WILL HOLD MEETING OF NATIONAL SOCIETY FOR VOCATIONAL EDUCATION

The National Society for Vocational Education will hold its annual meeting December 3-5, at Cleveland, O. The Hotel Statler will be the convention headquarters, and the arrangement is such that a special lobby is reserved for the convention, with all the convention rooms leading from the central meeting place. Unusual facilities are being provided for the exhibitors. Power will be supplied for displaying the machines to be exhibited.

It is announced that the various program committees have developed fine programs which will be ready for distribution in the near future. Speakers of international reputation will be on the program, and it is expected that Dr. C. A. Prosser of Minneapolis will be present to present his reply to the attack on the "Fifty-Fifty Plan" as printed in the World's Work.

Information concerning the program and speakers may be obtained by writing to President L. H. Dennis, or to Howard L. Briggs, chairman of the convention committee, Cleveland.

NEW BOOKS

House Wiring

By G. A. Willoughby. Cloth, 230 pages. Price, $2, net. John Wiley & Sons, New York, N. Y.

This text develops a complete course in vocational "wiring" by the job sheet method. Job No. 1 is presented very completely, with all the information concerning materials, tools, operations, circuits, etc. Illustrations including wiring diagrams, sketches of the installation required, etc., are included, with ample descriptions to make their connection with the job entirely clear. References to general principles of electricity are given so that the entire job may be clear to the student, even without the help of an instructor.

The entire book follows the plan of Job 1, except that information, descriptions of operations, etc., are never repeated and the student's growing knowledge and skill are taken for granted in all things except entirely new principles or operations.

The five main chapters of the book take up knob-and tube wiring by the tap system and by the loop system, armored cable wiring, conduit wiring, and miscellaneous construction jobs (fixture, bell, and similar work). A final chapter contains electrical principles, code information, trade terms, etc. The book is well illustrated.

Business Law

Alfred W. Bays. Cloth, 8 vo., 500 pages. The Macmillan Co., New York.

The broad field of law applied to business transactions and general business situations is covered in this book in a comparatively untechnical way. The general principles are stated in series of logical chapters and are emphasized by summaries of actual cases. Each main section is followed by a group of projects in business which the student is asked to work out as a means of applying his knowledge of principles to concrete situations. The book is attractively written and gives evidence of close adaptation of chapter lengths, sub-divisions of topics, etc., to school needs where but brief time can be devoted to the subject.

Hooked Rugs and How to Make Them

By Anna M. Laise Phillips. Cloth, 154 pages. Price, $2. Macmillan Co., New York, Chicago.

This book has been prepared in response to the present-day demand for a return to the handmade rugs of early Colonial days. The author tells how she first became interested in hooked rugs, and what she discovered of the history and romance of the craft of Scotland and America.

The book offers several practical chapters on how to make rugs. It tells how to mark in designs, what materials to use for foundations, what kind of frames and hooks to use, and describes the method of hooking in the design. There are specific suggestions for rugs for city and country homes, rugs for the several rooms of a house, and rugs of a knitted, crocheted, or woven character. There are chapters on the preservation and mending of rugs, which are an important part of the material offered.

The book is of interest and value not only to those who make rugs, but also to those who are interested in collecting specimens of this old-time art. While the author is too advanced in her viewpoint of the art to suggest specific patterns or color combinations, a chapter of directly usable patterns, with specifications for materials, colors, etc., would be greatly appreciated by teachers and isolated beginners.

Standards of the Hydraulic Society

Third Edition, 1925. Published by the Society at 90 West Street, New York, N. Y.

This publication contains not only the code of ethics of the organization, but also a vast amount of technical information on the classification of pumps, the design and capacity of various types of pumps, friction of water and other liquids, materials used for special service pumps, location of troubles, etc. Complete tabulations are included.

Manual Education and Supplies and Equipment for Elementary Schools. Prepared by C. A. Kunou and issued by the Los Angeles city school district No. 111. The Department of Elementary Manual Training in Los Angeles offers perhaps the broadest courses of any large city in the United States. The work includes woodwork, leatherwork and shoe repairing, gilding and composition work, metal work, ceramics, reed work and paper work.

The present pamphlet lists all of the standard equipment, supplies and materials which the board furnishes for use in the shops. In each case, estimates are given of the standard unit quantities necessary for a year's work. The pamphlet also includes floor plans and specifications for the standard elementary manual education rooms.

Copies of the pamphlet may be obtained by any school authority upon the payment of ten cents to cover the cost of mailing.

Child Welfare. A special bulletin issued by the Department of Home Economics, of the College of Industrial Arts, Denton, Tex. The bulletin has been prepared in response to a demand from various organizations in Texas. It covers briefly the principal points to be considered in feeding and clothing the child from birth through adolescence, and a short discussion of food for the mother during the pre-natal period. The presentation is necessarily brief, but the aim has been to make it comprehensive, and to provide an outline as well as an inspiration for further study of child welfare. A number of suggestive reference lists are provided for the benefit of the reader.

Everyday Art. A monthly publication of the American Crayon Company for October, 1925. The publication contains a number of brief, illustrated articles on art topics and a memorial tribute to Mr. Hugo B. Froehlich.

PUBLICATIONS RECEIVED

Home-Study Hand Books. Published by American Technical Society, Chicago, Ill. A list of books on technical, industrial, scientific, commercial, engineering and other subjects, together with brief descriptions and prices.

A Quarter Century of Public School Art. By C. Valentine Kirby. Paper, fifteen pages. Issued by Binney & Smith Co., New York City. During the past quarter of a century, it may be said that formal geometric drawing, mechanical perspective, type solids, formal exercises, and a general attitude of restraint and repression passed off the stage, and in their place have appeared imaginative drawing, joyous color, purposeful design, and an ever-growing evaluation of art appreciation—all planned to meet the needs of the child, the community and the state.

At the present time, the growth of art quality in manufactured products, the superiority of advertising art, the fine quality of art displayed in retail establishments, are matters of common observation and knowledge. Last year a million persons visited the Metropolitan Museum of Art in New York, and another million visited the Art Institute in Chicago. More than seventy cities in the country have art museums at the present time, and others are being planned. The art schools are crowded, almost without exception, and there are art alliances, art-trade clubs, and businessmen's art clubs.

The Manufacture of Rubber Footwear. An illustrated story of rubber from its growth to the finished product. Paper, 39 pages. Issued by the LaCrosse Rubber Mills Co., LaCrosse, Wis. The story opens with a brief historical sketch of rubber in past days, and then proceeds to a study of the origin of rubber, how it is gathered and treated, the beginning of manufactured rubber products, vulcanization, and a description of the processes in the making of rubber footwear. The pamphlet illustrates a few of the kinds of footwear manufactured by the firm, such as overshoes, rubbers and rubber-soled shoes.

Industrial Arts Vocabulary

F. S. Crispin, Philadelphia, Pa.

Corrugated Iron—Sheet iron formed into parallel ridges and depressions, alternately convex and concave.

Cotter—A tapered rod or pin generally flat or round in section, used for wedging the ends of rods or of pins into bosses, or of strap ends over their rods.

Counterbalancing—The addition of weight to a moving mass, usually a wheel or crank, in order to place the same in perfect balance.

Counter Bore—The enlarging of a hole through part of its length by boring.

Counter Bracing (arch.) or cross bracing—Diagonal bracing used in a truss or girder, for giving additional support to the beam and relieving it of a transverse stress.

Counter Shaft—A short shaft, intermediate, or between the line of main shafting and the machines it has to drive.

Countersink—A hole recessed conically for the head of a screw or rivet. The tool with which a hole is countersunk.

Countersunk—A hole recessed with a countersink.

Couple—Consists of two forces which are equal and opposite.

Cove Molding (arch.)—A concave molding.

Crane—A machine used for lifting heavy weights by the use of gear wheels, chain-drum, chain and jib; worked by hand, steam, hydraulic, or electric power.

Crank—An arm or lever which rotates about the axis of a shaft.

Creosoting—The injection of creosote into timber which is to be exposed to weather, in order to increase its durability.

Creosoting Cylinders—Strong wrought iron cylinders in which railway ties, sleepers, etc., are exhausted of their moisture and filled with creosote pumped in under pressure.

Crossed Belt—A driving belt which has a twist between the driving and driven pulleys, causing a reversal of direction.

Crosscut Saw—A hand saw used for cutting across the grain of wood.

Cross Grain—A section of timber taken at right angles or at a low angle with the direction of the longitudinal grain.

Cross Head—That portion of an engine or pump which connects the piston and connecting rods.

Cross Section—A transverse section at right angles with the longitudinal axis of the piece of work or drawing, through which the section is taken.

Cross Slide—The horizontal slide or bridge which carries the tool box of a metal planing machine.

Crow Bar—or pinch bar—A round iron bar flattened to a chisel-like point at one end, and used as a lever.

Crown Molding—The term relates to location rather than shape. Such moldings are used as a top or upper finish; frequently in cornice work.

Crushing Strain—The strain which causes the failure of a material by compression.

Crystallization of Iron—This is effected by the conditions under which the metal is cooled or from hammering.

Cube—A solid bounded by six equal squares and having all its angles right angles. The cube of a number is the product of the number multiplied twice into itself.

Culvert

Culvert—An artificial, covered channel for the passage of water; as under a road.

Cup Leather—A leather packing used for the pistons of hydraulic machines.

Cupola—The furnace in which cast iron is melted for foundry use.

Curve—A line that continuously changes its direction.

Curvilinear—A line or path of motion which is curved.

Cut—The removal of a shaving from a piece of work with the lathe, or planing, boring, and similar machines.

Cutting Face—That face of the cutting tool against which the material is removed.

Cutter—Any cutting tool fixed in a machine, for the automatic cutting of wood or metal.

Cutting Pliers—Pliers which in addition to the flat and roughened jaws, have a pair of sharp nippers placed to one side for cutting off wire.

Cycloid—A curve, generated by a point on a circle when that circle rolls on a straight line.

Cylinder—A circular body of uniform diameter, the extremities of which are equal parallel circles.

Cylinder Bore—The internal diameter of an engine cylinder. The bore and the length of a piston stroke are necessary factors in determining the horse-power of an engine.

Cylinder Gauge—A gauge consisting of two pieces, a plug gauge furnished with a handle, and a collar gauge into which the plug gauge fits. These gauges are used as templets for boring and turning parts which are required to fit together.

Cypress—An evergreen tree which grows in southern United States; one of the most durable woods, very like cedar; adapted to both inside and outside work, in the building trades.

(To Be Continued)

NEWS AND NOTES

Certificates of Craftsmanship Issued. The first fall meeting of the Philadelphia Building Congress was held at the City Club, with employers of the building trades in attendance. At this meeting, the Committee on Awards, after reviewing the recommendations of architects and others who passed upon the work of 1924, awarded certificates to individuals and firms as follows:

Guildsmen—To those in the crafts, who have shown especial skill in developing the artistry or handicraft possibilities in their field of work, a certificate of guildsman was awarded to:

J. H. Dulles Allen—tiles and potteryware.
John Barber—woodworking and furniture.
Nicola D'Ascenzo—stained and leaded glass.
Carl Dubs—woodworking and furniture.
Edward Maene—sculpture, modeling, carving.
Hollingsworth Pearce—metal work.
William A. Schafer—wood carving.
Max Voight—plastic arts.
Samuel Yellin—iron work.
William A. Zimmerman—metal work.

Craftsmen—To those now designated by various names, such as mechanics, artisans, etc., who in the building craft have shown skill, ability, efficiency, as well as knowledge and technique, a certificate as a craftsman was awarded to:

John Campbell—steamfitting.
Oliver Cromwell—stair building.
Fred Guenther—foremanship in building construction.
Charles Haberle—slate roofing.
Charles H. Leader—tile setting.
Harry F. Leslie—foremanship in building construction.
Louis Rieco—stone masonry and brickwork.
Lew Smith—foremanship in building construction.

Builders and Subcontractors—To those who have satisfactorily either erected buildings or other structures therein, have encouraged pride of craft on the part of coworkers, and have given individual recognition of it when deserved, a certificate as a cooperating master craftsman was awarded to:

Lorenzon Brothers—stone masonry and brickwork.
A. Wilt & Sons Co.—millwork and cabinet work.
William Moore Co.—tilework and slate work.
Wesley Sloan—tilework and slatework.
F. A. Black & Co.—painting and decorating.
D. R. MacGregor Sons—painting and decorating.
Harry H. Rudolph—painting and decorating.

The purpose of the certificates is to encourage and to preserve in Philadelphia and its metropolitan area, the true spirit of craftsmanship, and to give recognition to those whose skill, patience and toil have builded well in the community. An interesting feature in connection with the awards is that they accord with a popular vote cast on ballots at the recent exhibition of architecture and allied arts held in the Philadelphia Art Museum. The certificates are in themselves a work of art and are designed by George Howe of the firm of Mellor, Meigs & Howe.

PERSONAL NEWS

Mr. Royal B. Farnum, state director of art education in Massachusetts, and **Mr. Robert O. Small**, director of vocational education in the same state, visited Texas at Thanksgiving time, where they made addresses before the industrial art section of the State Teachers' Association at Dallas.

Mr. Charles Marten has resigned his position as professor of industrial education at the Agricultural and Mechanical College, College Station, Tex.

Mr. C. W. Crawford has been made associate professor of mechanical drawing at the Texas A. and M. College.

NOW, ARE THERE ANY QUESTIONS?

Anonymous Questions

Questions intended for the Questions and Answers column of the MAGAZINE should invariably include the full name and address of the person who asks the question. Anonymous communications and letters which contain only the initials of inquirers cannot be answered.

Most questions which reach us are handled by mail and only a small percentage which appear to be of general interest in the MAGAZINE.

Auto Finish Trouble

Q. 536. Last summer I varnished my car all over and now it is turning white and peeling off on the fenders, hood, etc., which had baked enamel.

Please inform me if there is any way I can remove this varnish without injuring the enamel so I won't have to refinish the whole car.—H. E. P.

A: It would appear at this time that the only practical method would be to use varnish remover and take off the faulty finish clear down to the metal. It is quite apparent that incorrect material was applied over an improperly cleaned surface, resulting in the defects which you have mentioned. A job of this kind should not be undertaken by any other than an experienced auto paint shop man. The advertisements which one sees in the present day magazine depicting father giving the old "bus" a coat of quick drying auto enamel is little less than ridiculous, since practically all of them illustrate the work being done in the open sunlight or the open doored garage, in either of which cases the best brush hand ever born could not do a respectable job worthy of the name.—Ralph G. Waring.

Brazing Saws

Q. 546. Please state what compounds should be used in mending a light Band Saw?—P. N. W.

A: Various brazing fluids and solders are on the market for brazing band saws. The following method of brazing band saws, as described by Mr. T. F. Googerty has been found very satisfactory.

"Band saws are fastened together by brazing with a hard solder. The solder can be purchased from a dealer, and it is called "silver solder." It costs about 75 cents an ounce. The solder is about three-fourths of an inch wide and very thin.

"The method used in soldering is to prepare the ends of the saw by filing a short bevel. The length of the lap depends on the size of the saw. Two or three teeth in length is suitable for the lap. The saw is held in a cast iron clamp while brazing. This clamp is made expressly for the purpose. Then the saw is fastened in place, a piece of solder is put between the laps, also some borax. Heat is then applied until the solder flows.

"The simplest way to heat the solder is to use a heavy pair of tongs which can be heated in a forge fire. When the tongs are just a red heat, squeeze the lamps until the solder flows. It is a good plan to have another pair of tongs with a black heat in them, to catch the lap after the hot one is removed. This squeezes the lap right, and chills it so that the laps cannot come apart when released with the tongs. The reason that the last pair of tongs used is given a black heat, is not to chill the saw too quickly, and so temper it too hard.

"A form to hold the ends of the saw can be made out of wood. (See drawing.) The square cut-out of the center, 3 inches by 3 inches, is where the laps come. The saw is laid on the shelf, and is fastened with a pair of clamps to hold it in position while applying the heat. When applying the heat the tongs must not be too hot or the saw will be burned, or over-heated. The tongs should be a dark red color, and they should be held on the laps just long enough to heat the laps to a red heat."

A Finish Room, Etc.

Q. 551. I have the problem of finishing school projects without a finishing room—no place to put things to dry where dust will not collect on them.

I am interested in finishing yellow poplar projects in mahogany, browns, or other appropriate finishes. What is the best thing I can do? A quick drying, easily applied finish is desired.—T. O. M.

A: Your conditions are typical of many shops which I have visited from time to time. In most instances, a simple rearrangement of benches to avoid the usual row upon row effects suffice to provide floor space either at the rear or center of the room. This was obtained by facing the benches in a double line toward the outside windows, with careful attention toward the minimum space required for working conditions. Many shops at the present time fail to make use of their floor space and provide room for setting up work or other purposes simply because they are still laid out on the old Swedish plan of the square.

With the rearrangement according to the lighting conditions and placement of the blackboard, the additional space provided will permit the erection of a frame work which can be taken down and stored if necessary. This should be made of ⅞"x4" stock, half lapped at the corners and cross braced so as to form the five sides of a frame 6'x7'x10'. This should be covered with cheese cloth, double stitched on the seams and tacked on to the frame while wet after having been wrung out reasonably dry in a solution of three parts of water glass to six parts of water. If desired, the tacks may be further protected with a ⅜"x⅞" molding strip. It is well to provide a 36" door on one end. The water glass will hold down the fuzz of the cheese cloth, add greatly to its strength, will cause it to shrink smooth while drying, will allow for plenty of light under ordinary conditions, and last of all, make the cloth fire resistant.

If necessary, an electric light can be run into the box. With a little care in keeping this enclosure clean, lightly sprinkling the floor just previous to working, even high grade varnish work can be done in such a place as I have demonstrated many times.

As far as the yellow poplar is concerned, it is entirely practical to sponge the work first to raise the grain, dents, or bruises, and after drying sand glass smooth with very fine paper. All edges should be rounded the thickness of the average pencil lead. A mahogany or brown water stain should then be applied and, in this particular case, given a coat of dilute orange shellac which has been tinted with a trace of Bismarck brown alcohol soluble. When this is dry, it should be sanded glass smooth with a split 6-0 garnet paper and reshellaced, using a heavier solution of shellac, made from equal parts of stock and denatured alcohol. Should be repeated for three or four coats, and the last coat may be then rubbed with FF pumice stone, felt pad and crude petroleum to a smooth, true surface.—Ralph G. Waring.

Painting With Oil Colors

Q. 552. I am doing some oil work for Christmas and would like to know just what medium to use in painting with oils on sanitas cloth. I also want to paint on silk. What shall I use to keep the paint from spreading? I am using pastels with water. Is there a medium that may be used instead of water that will make them stick?—I. H. G.

A: To paint on oil cloth or sanitol, use enamel. Purchase a can of white enamel, and color with artist's tube oil paints. This obviates purchasing so many cans of colored enamel.

To paint on parchment, use artist's oil colors. Dilute with turpentine to suit. Do not use the colors on parchmentized paper. Paint the design first, then dry thoroughly, and parchmentize.—B. H.

Correction. In the November issue of the magazine Stout Institute of Menomonie, Wisconsin, was credited with a total enrollment of 224. This is incorrect. The figure indicated was the enrollment of men, which has since that time increased to 227. The total enrollment of the school, counting men and women, is 473, which is a considerable increase over former years.

Mr. Alex. Waite, vice-principal of the Breckenridge high school, San Antonio, Tex., is vocational counsellor for boys in the senior high school.

Mr. Harry Blumenthal and **Mr. H. E. Rogers** are in charge of the printing department recently opened in the El Paso Vocational School, El Paso, Tex.

Mr. John Faville, Jr., has been appointed instructor in industrial arts at Stout Institute, Menomonie, Wis. Mr. Faville succeeds Mr. Field, who resigned late this fall.

Mr. Paul H. Graven, director of vocational education at Madison, Wis., died September 20th in a Madison hospital, following an operation for appendicitis. He was 37 years old.

Give that Model the Proper Finish

For a blue print of this smoking cabinet send us 25 cents in stamps or coin.

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Johnson's Artistic Wood Finishes are particularly adapted for Woodworking Classes as they may be applied by the youngest and most inexperienced pupils with good results. Johnson's Artistic Wood Finishes are standard for Vocational Education—they are being used all over the United States and Canada for this purpose.

Our line of Artistic Wood Finishes is complete—it includes—

Johnson's Paste Wood Filler ***Johnson's Perfectone Undercoat***
Johnson's Prepared Wax ***Johnson's Perfectone Enamel***
Johnson's Crack Filler ***Johnson's Electric Solvo***
Johnson's Wood Dye ***Johnson's Varnishes***

Any time specific information is desired on the finishing of wooden projects or whenever you want specially finished wood panels, do not hesitate to write us. We solicit correspondence with Woodworking Instructors.

We also have a very attractive exhibit of wood panels, which we will gladly send, free and postpaid, to any instructor who will give it wall space in his shop. It shows panels of various woods finished in beautiful stained effects with Johnson's Wood Dye, Under-Lac, Varnish, Wax, etc. And in enameled effects with Johnson's Perfectone Undercoat and Enamel.

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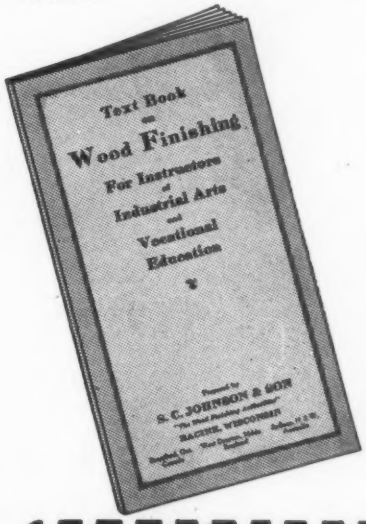

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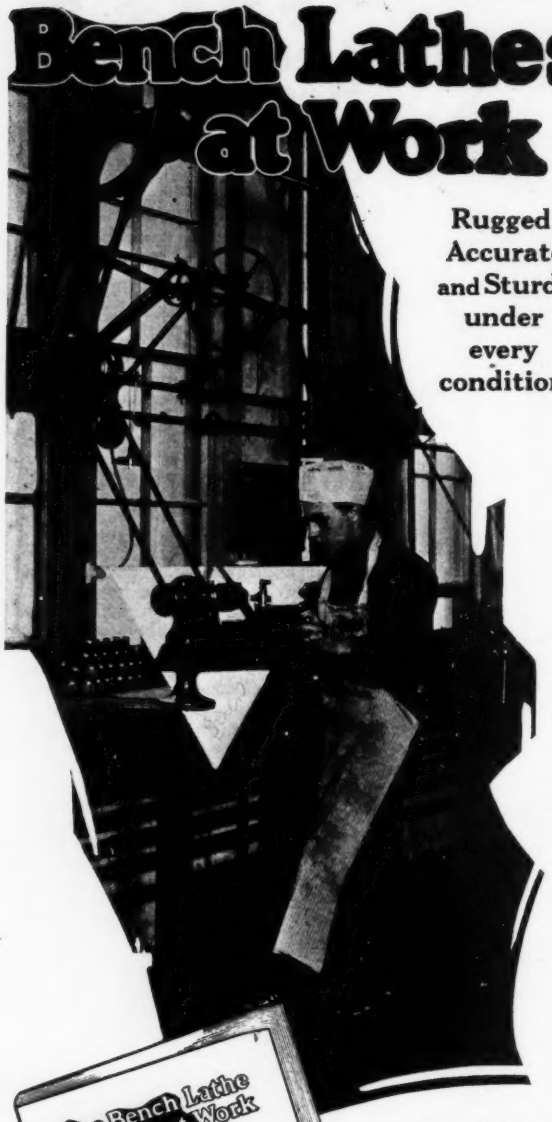

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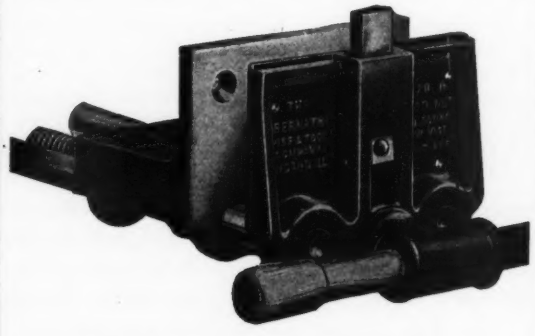

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Disston No. 3 Bevel

The tool for the boy in school. Toughened blade of Disston Steel does not kink. Nickle plated iron stock stands the hard knocks.

And the patented Disston Locking device holds the blade securely in adjustment.

Give the boy tools that he'll learn to trust

Perhaps his bevel just slipped, and he'll have to set it again; then proceed slowly so that it won't slip again.

Give him a Disston Bevel.... with the Disston patented locking device.

Then he can go ahead with confidence that the adjustment is always right. For knocks and jars do not disturb the setting.

A quarter turn on the thumb-screw locks it where he wants it.

It's little features like this that permit quick learning instead of slow, irksome progress.

Features that you always find in Disston Tools for the school.

Because Disston found out what boys needed in tools. Then Disston Tools were made that way.

Send for free illustrated booklet of Disston Tools for the school.

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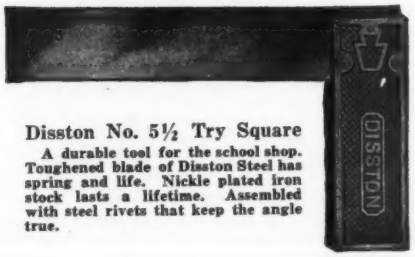
A gauge designed with the aid of instructors for school use.

Heavy spur of high tempered steel stays sharp.

Screw in stem prevents removal of head.

No graduations on bar. Rule must be used to set gauge. This develops correct practice in pupils.



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A durable tool for the school shop. Toughened blade of Disston Steel has spring and life. Nickle plated iron stock lasts a lifetime. Assembled with steel rivets that keep the angle true.

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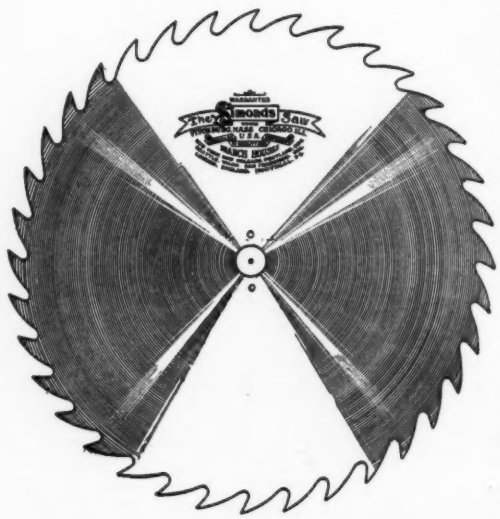

Edge-holding saws that cut smooth are essential to manual training and vocational school shops. It is more economical to get Simonds Circular and Narrow Band Saws because they hold their edge longer and outlast others. Simonds own steel is the foundation of all Simonds Saws.

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Johnson Clutches

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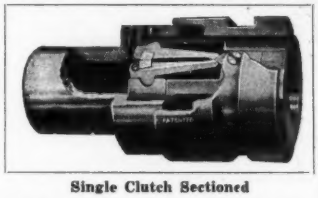
In New York Schools

Just note this extract from the specifications for the James Monroe High School built recently in New York City:

(b) The very highest grade of Friction Driving Clutches of the CARLYLE JOHNSON CO., or other equal, will be approved.



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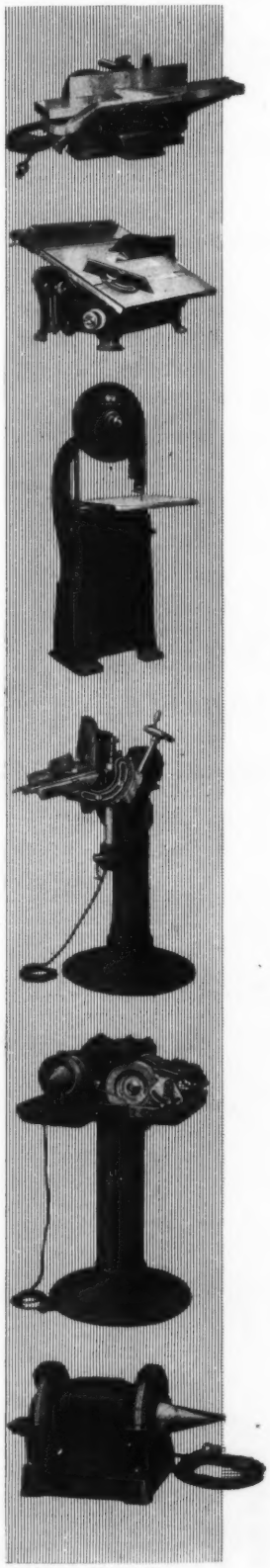
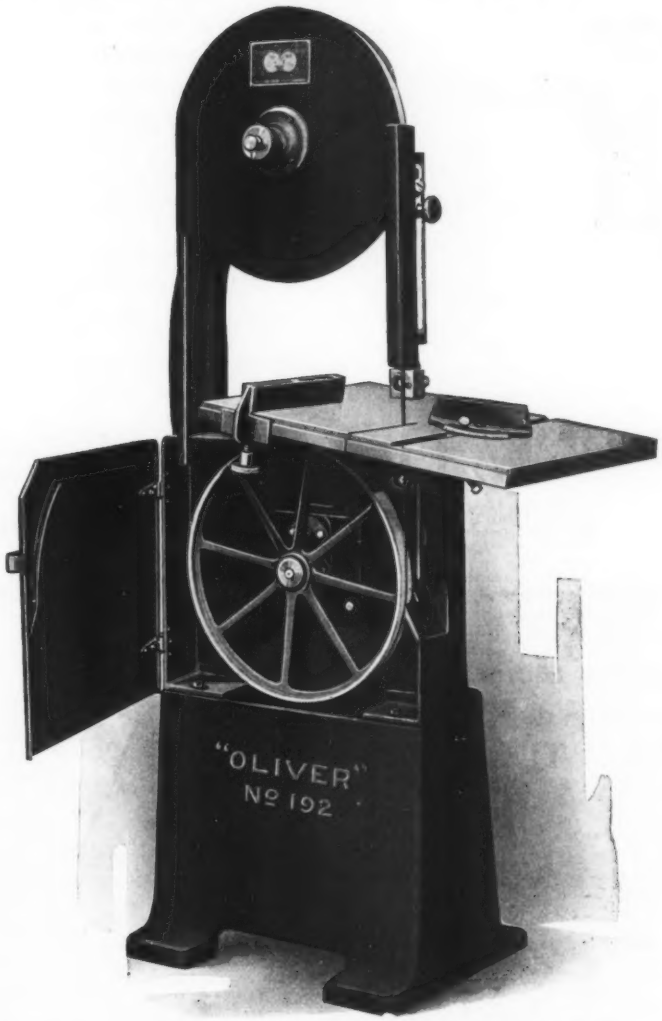


"Oliver" Portable Woodworking Machinery



The Variety of Work you can do on "Oliver" Portable Woodworking Machinery is surprising.

The "Oliver" No. 192 18-inch Universal Band Saw will rip, mitre, cut off and do scroll sawing. The table tilts. A light running, ball bearing saw that operates from a lamp socket.

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Oliver Machinery Co.

Grand Rapids, Mich., U. S. A.

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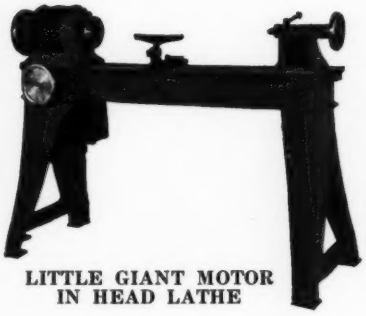

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Use equipment that stands steady, firm, noiseless, under the most rapid motion.

How vibration may be so overcome as to be negligible is demonstrated in The Little Giant Line of Lathes and Band Saws.

That desirable and important feature is the result of extra heavy beds or frames, plus perfect alignment of parts, plus perfect Ball Bearings, and the highest standard of motors, when motors are used.

A non-vibrating Lathe or Band Saw is safe, accurate, dependable and LASTING.

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As in the case of Des Moines — progressive educators everywhere who carefully investigate this wonderful new machine recognize that it offers a thoroughly practical means of teaching nearly all the operations of wood shop practice —at a small fraction of the cost the usual equipment entails.

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rip, cross-cut,
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All of these operations can be done on it practically as they are done on the individual machines. Ample power and convenience of arrangement permits as many as three operators to work on it simultaneously unhampered, safely. Quality is built into every part of it.

For complete details write for bulletin E-2.

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Get this booklet describing the Union line before you select wood working machinery for manual training or vocational schools. Union advantages include heavy, rigid construction low first and upkeep costs, no installation expense, savings on floor space, and wonderful accuracy. Our new booklet is informative and interesting. Yours for the asking.

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UNION PORTABLE AND BENCH TYPE WOOD WORKING MACHINES

Built Especially for School Use!

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Safe, simple and inexpensive briefly explains the all geared-head 14" x 6' Sidney Heavy Pattern Engine Lathe shown here. Designed and built to school room specifications and requirements.

Has chip pan, apron control, bronze-bushed stud bearings in the apron and a ball bearing idler arrangement for endless drive belt. A motor with drum reversing switch, hardened collars with safety shearing pins in the lead screw and feed rod. Also a complete ball-bearing all-geared headstock with all shafts having ball bearings except the main spindle bearing which is phosphor bronze. Motor is enclosed in cabinet leg, making for greater safety and efficiency.

Send for our special bulletin fully describing this unusual lathe. Address Dept. 411.

Our Engineering Dept. will gladly help in solving any shop problem. This service is free to all schools.

The Sidney Machine Tool Co.
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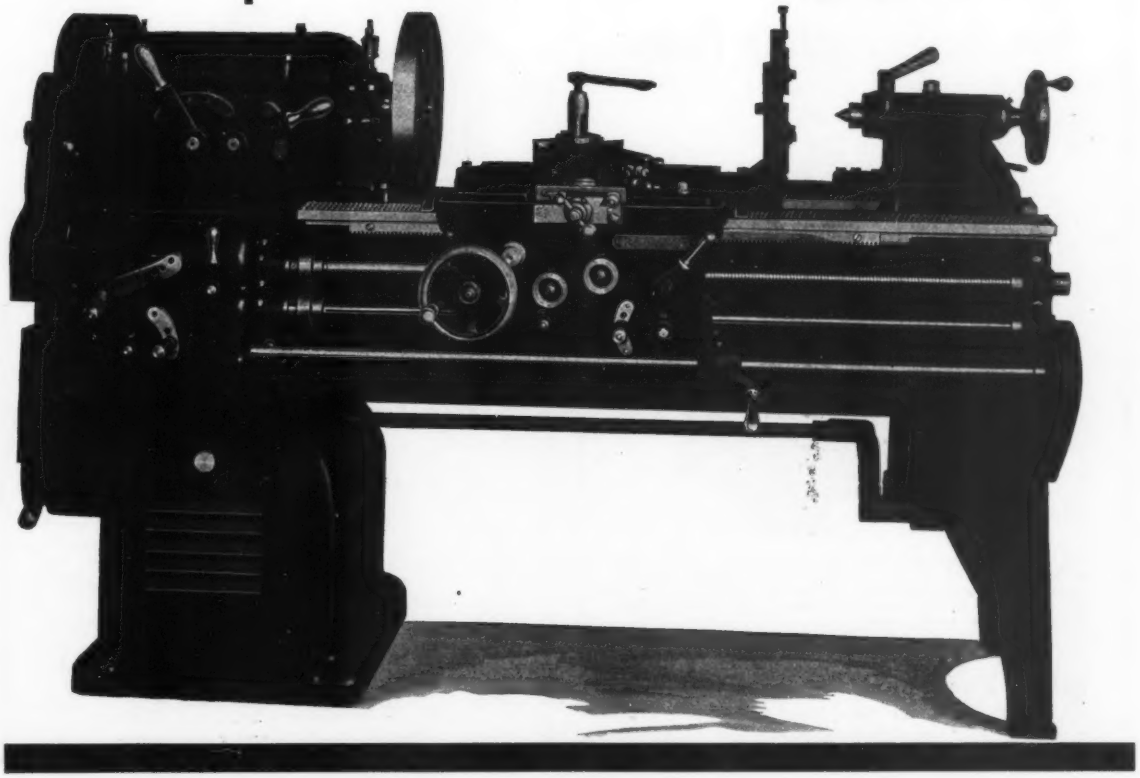

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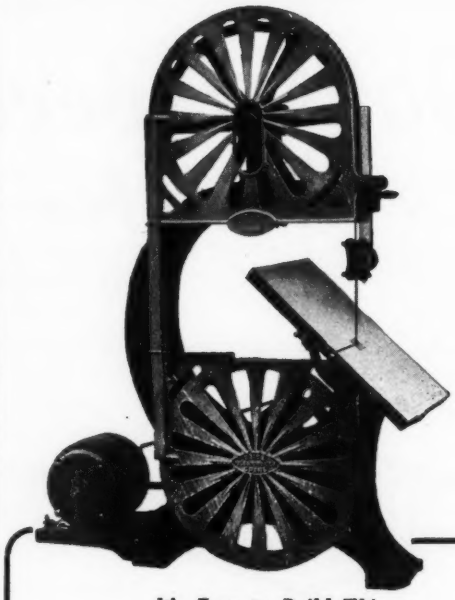
Specialists in Glue Room Equipment — Glue Pots — Glue Spreaders — Veneer Presses — Retaining Clamps — Trestle Clamps — Etc.



It's Easy to Build Things with a Boice-Crane Bench Band Saw

With this machine in your shop it is easy to do beautiful work. Simple to operate. Portable. Attaches to light socket.
Price as shown with aluminum guards, two ball-bearing roller guides, ⅓ hp. 110 volt 60 cycle ball-bearing motor, cord, plug, switch, and two ¼" wide blades. Also sold without motor or guards..... **$125.50**

See this machine at the Cleveland Convention Dec. 3, 4, and 5.
Send for 64 page booklet describing Boice-Crane Bench Circular Saws, 14" Bench Band Saw, Jointers and Lathes.

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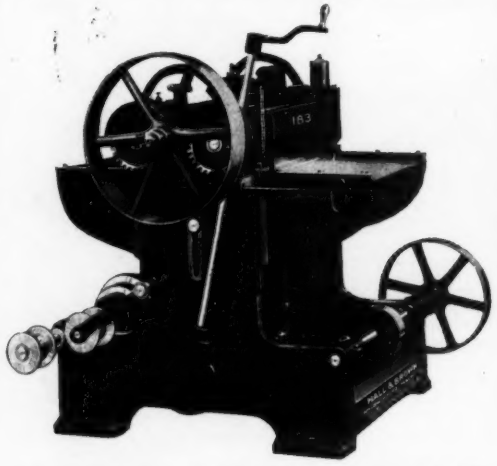
New Model Finishing Planer



No. 183 is the very latest in finishing planers. It is built in three sizes—20, 24 and 30 inches. The table lowers 8 inches. Machine is furnished with three rates of feed. No. 183 forms part of the equipment of the largest manual training departments in St. Louis.

Write for complete description.

Hall & Brown Wood Working Machine Co.

Broadway, Tyler, Ninth Sts.,
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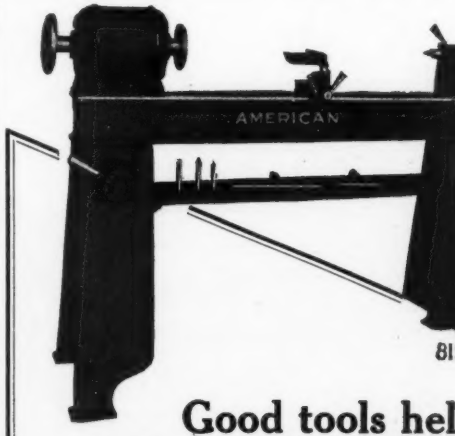

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Here is a high speed ball bearing lathe which proves that safety is not incompatible with high speed, accurate work, and pleasing design.

While primarily designed for use in manual training schools, it is capable of turning out work which would delight the heart of the most fastidious craftsman. We sell many to schools on the basis that respect for good tools is an important part of any course in manual training.

The same high standards make "American" saw benches, planers, jointers, band saws and workers preferred by instructors who want their students to have the best there is.

Write for free booklet.

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74 Main St., Hackettstown, N. J.
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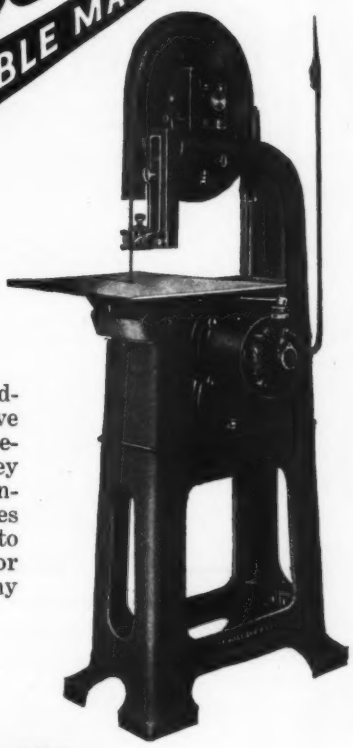
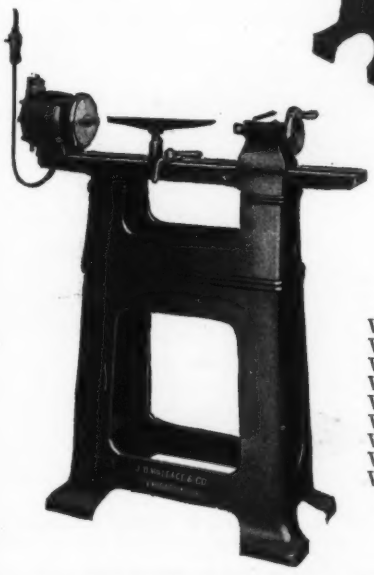
American Manual Training Equipment.

Wallace
PORTABLE MACHINES



Wallace Portable Woodworking Machines give students practical experience on machines they will find in actual industry. These machines are accurate, easy to operate, direct motor driven, attach to any light socket.



Wallace School Equipment:—

Wallace 16" Band Saw
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Wallace Plain Saw
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Wallace 4" Planer
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Wonder Spindle Sander
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Offer Instructors Real Class-Room Helps

Solar-Wallace Job Sheets of issue No. 4 now ready. Write for your copy. If you do not have a set of these helps to date, complete set will be mailed on request. Use school stationery in writing. These practical problems, drawings and instructions will be a great help in class-room assignments.

You are cordially invited to visit the Wallace Booth in the Exhibit Hall at the Convention of the National Society for Vocational Education at Cleveland. Our exhibit will prove both interesting and helpful.

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In each line of products there is always a leading make. In the Hand Clamp field the "Jorgensen" Peerless Adjustable Steel-Spindle ones are the leaders—and if you firmly believe in using the best, you will specify them in your requisition.

Adjustable to various positions. Grips to angular or straight work with equal facility. Twelve sizes and each priced right.

Hard Maple Jaws.

Steel Spindles and Nuts.

"PONY" Cabinet Clamp

For lightness combined with strength this clamp has no equal. All parts are selected from the best materials obtainable and we have spared no effort to make the "Pony" the finest thing of its kind on the market. Made in sizes to open 18 to 72 in.

Write us for Catalogue No. 5-EE and prices or get them from your dealer.

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Not affected by Dry Heat or Dampness
TRADE MARK
SURE GRIP
PROVED BEST BY TEST
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Positively the best adhesive known for Repairing Furniture and Ornaments of all kinds
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will make the work easier and more permanent. There is no waste from its use which makes it the cheapest glue to use.

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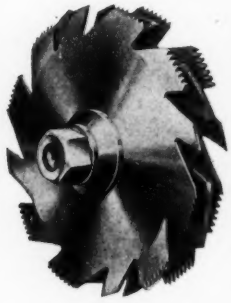
Speed up!



You can do it, even on the most complex grooving and cutting if you use the Huther Dado Head!

With this tool the most complicated cutting and grooving are made easy. Perfect work is assured, and speed throughout the whole process increased.

Made by the inventors and original patentees of the Dado Head cutter, and backed by more than fifty years experience in saw manufacture, this tool is an investment that pays profits from the very start.

Let us send you illustrated catalog showing the complete line of Huther Saws.

Huther Bros. Saw Mfg. Co.

Makers of Better Saws for More Than Fifty Years

Rochester, N. Y.

No cutting tool is better than its edge
Keep the tools sharp

No. 475

PLURALITY OILSTONE TOOL GRINDER

THE most convenient, serviceable and efficient tool sharpening machine ever made.

This new Tool Grinder has been carefully designed to combine many new advantages with the essential features of older models. It combines five basic units in one machine: *coarse oilstone wheel, fine oilstone wheel, grinding cone, leather stropping wheel, emery wheel,* and all accessible from two adjacent sides.

It is motor driven, ball bearing throughout, and every unit is thoroughly guarded.

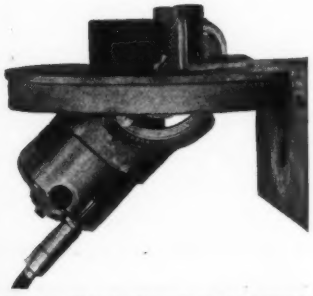
Write for full descriptive bulletin.

MUMMERT-DIXON CO.
Hanover, Pa.
Originators and Pioneer Manufacturers of Oilstone Tool Grinders

Students Turn Out Professional Work

with Carter Shapers and Routers

So easy to operate are the Carter Electric Router and Shaper that students can turn out real professional work in a few trials. Students take to Carter machines because of their ingenious simplicity and the neat work they accomplish. With the various attachments the Carter Shaper or Router can be used for hundreds of different jobs. They are especially adapted for cabinet work or furniture making. Below are listed only a few of the ways in which you can use Carter Machines in your school shop.



Carter Hand Shaper with Bench Shaper Table. Tilting arrangement provides for making surface and corner cuts. Bench Table attachment, $22 extra.

Carter Router motor in Beading and Fluting attachment. Attachment, $15 extra.

A Few of the Uses for Carter Machines

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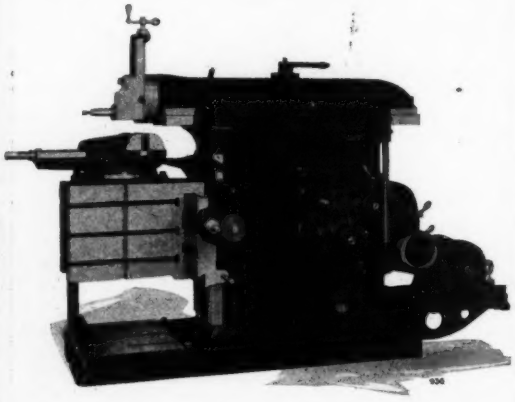

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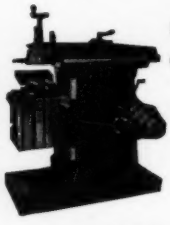

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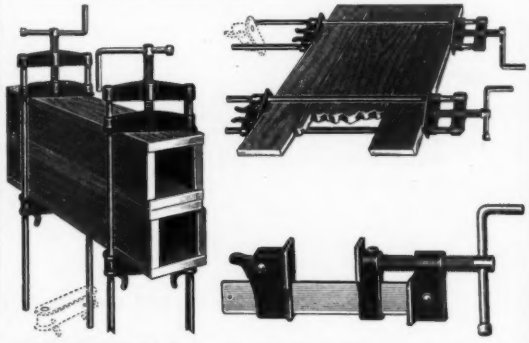

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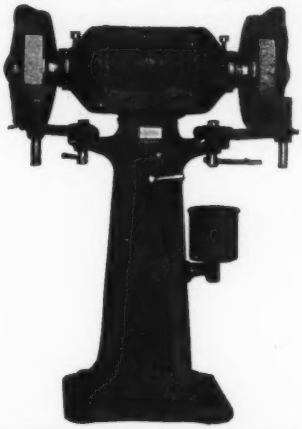

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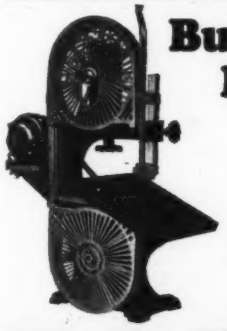

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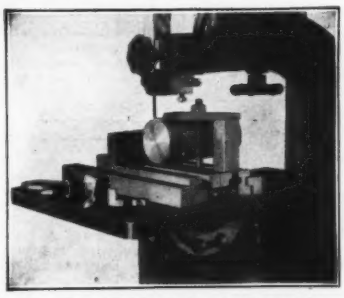

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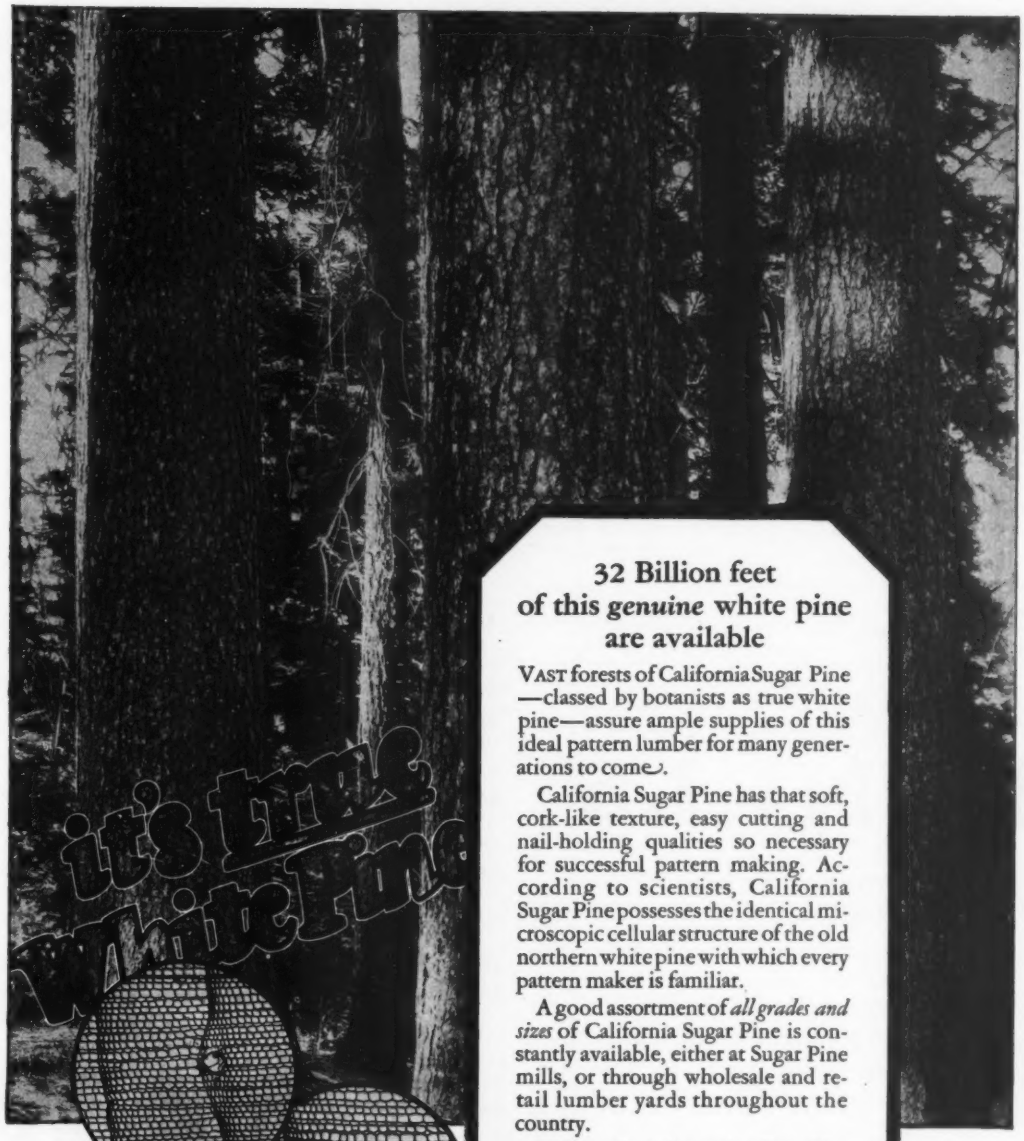

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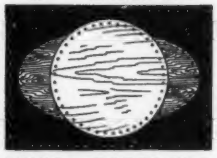
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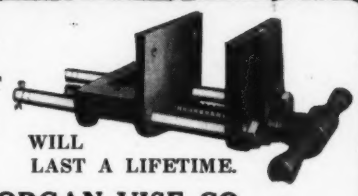
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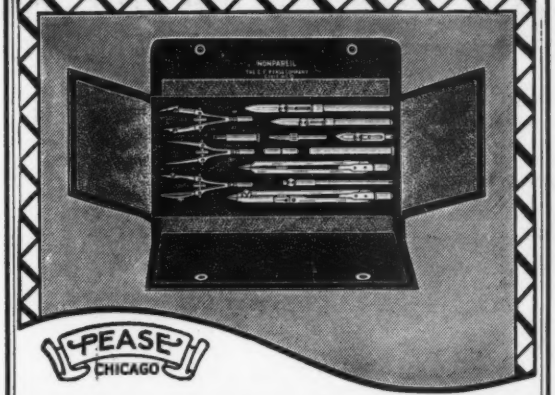

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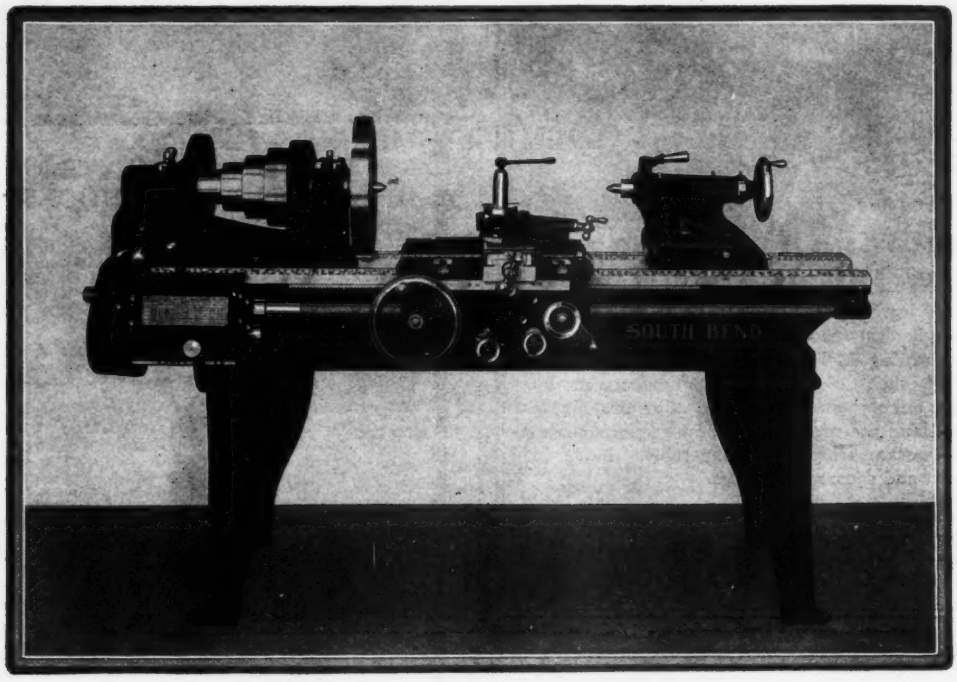

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—Increased friction on drive belt with wider pulleys.
—Increased weight.

AUTO REPAIR SHOP COURSE

Bulletins and Job Instruction Sheets

The Auto Repair Shop Course consists of Bulletins and Job Instruction Sheets describing the up-to-date methods of completely re-conditioning motors.

These Bulletins Are Free To Instructors

No. 85—Finishing Semi-Machined Pistons in the Lathe.
No. 86—Machining Valves in the Lathe.
No. 87—Truing Commutators and Undercutting Mica in the Lathe.
No. 88—Fitting Starter Ring Gears.
No. 89—Regrinding and Reboring Cylinders in the Lathe.
No. 90—Milling and Keyway Cutting in the Lathe.
No. 91—External and Internal Grinding in the Lathe.
No. 92—Machining Crankshafts in the Lathe.

SOUTH BEND MACHINE SHOP COURSE

Job Sheets and Blue Prints for 81 Projects

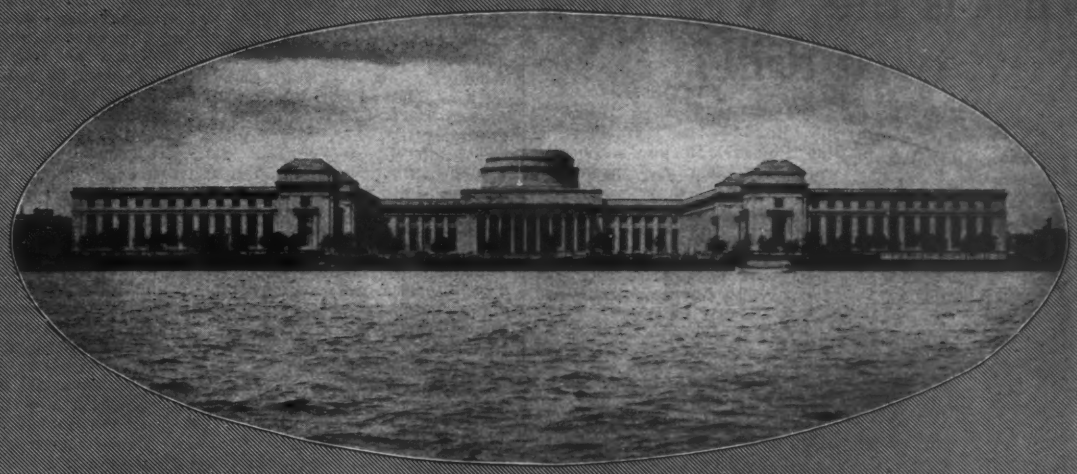
The South Bend Machine Shop Course consists of 81 Projects for which we furnish job sheets and blue prints. The blue prints are 12x18 ins. and show both detail and assembly drawings of each project. The job sheets take the student through the work on each project following the modern machine shop practice in industry. The hand book "How To Run A Lathe" is used for reference purposes and it gives complete instructions on all lathe operations.

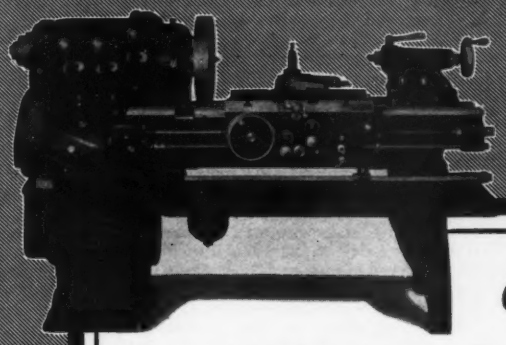
Bulletin No. 31-A gives complete description of the South Bend Machine Shop Course.

Write for Free Bulletin No. 31-A

SOUTH BEND LATHE WORKS

273 East Madison Street **South Bend, Indiana**





and now—

The Massachusetts Institute of Technology uses The

MONARCH Helical Geared Ball Bearing **LATHE**

as a part of their Metal Working Equipment.

The prestige of this Institute—the corner-stone of Massachusetts' enviable system of vocational education — attracts students from the four corners of the civilized world.

In choosing the equipment for these students, the directors of the Institute must base their choice upon equipment that will give students the greatest possible amount of experience.

We are proud of the selection of the MONARCH Engine Lathe as a part of the Institution's metal working equipment — proud that it has been selected solely upon its merit, after careful consideration, as the type of equipment necessary for the high degree of training which Massachusetts "Tech" gives to its students—a training which has been so creditably reflected on the Institution by its graduates.

We shall be glad to plan your vocational metal working shop. Give us a statement of your requirements and let our Free Engineering Advisory Service plan your shop, giving you an accurate estimate of the entire equipment cost. This service is gladly rendered without charge.

THE MONARCH MACHINE TOOL COMPANY, 404 OAK STREET, SIDNEY, OHIO.

What is the "Web" of a twist drill?

And the "Heel" — the "Lips" — the "Body" — and just where is the "Point"? Do you know just what "Lip Clearance" means?

The "HANDBOOK FOR DRILLERS" answers every question the student of modern drilling practice must know. It tells him not only the "How" but—what is more important the "Why" of the different parts of the twist drill.

Because this booklet is both theoretical and intensely practical, it is being used by hundreds of Vocational, Technical and High Schools throughout the world as the standard textbook on drilling practice.

The "HANDBOOK" is issued by this Company, not to promote the sale of its products, but to educate prospective, and not a few **experienced,** drill users to a better and more intelligent understanding of the twist drill and its use.

Instructors are cordially invited to ask for copies of the "HANDBOOK FOR DRILLERS" in any reasonable quantities, free of charge, for the use of their students.

The CLEVELAND TWIST DRILL COMPANY CLEVELAND
NEW YORK · CHICAGO · LONDON

TRADE MARK REG U. S. PAT OFF AND FOREIGN COUNTRIES

NEWS AND NOTES

Sheet Metal Classes Re-established. The Mechanics' Institute of New York City, which conducted classes in sheet metal work until a year ago, has re-established classes in that line, with Mr. C. McGraw as instructor. Under Mr. McGraw's direction, the class will be reorganized as one of the leading lines in the school. About twenty students are enrolled and the tuition is free and covers three years.

Trade Shops Well Equipped. New trade shops, with a large amount of equipment and tools, have been opened at the Phillips, Woodlawn and Ensley high schools, Birmingham, Ala.

With the opening of the school year, Birmingham offers trade training for all-day, evening and part-time pupils. Trade instruction is offered in drafting, machine-shop practice, printing, automobile mechanics, and a final course in electrical work is planned. The Industrial High School for Negroes offers a vocational course in shoe repairing which has attracted a large enrollment of prospective shoe repairmen.

Manual Training Teachers Meet. The manual training teachers of Clinton County, Iowa, held a meeting at Clinton, on October 15th and 16th, in connection with the regular County Teachers' Institute. The purpose of the meeting was to offer an exchange of ideas and inspiration for the men interested in the work, and to secure better acquaintance and fellowship among them.

Mr. W. B. McMahon opened the meeting with a word of welcome. Other speakers were Mr. W. D. Glasgow of Camanche, who talked on "The Job Sheet"; Mr. Overton of DeWitt, who took for his subject, "Shall We Adopt a Central Metal Shop?"; Mr. F. B. Ulish of Goose Lake, who talked on "Cement Work for the Rural Community"; Mr. R. F. Schulz of Clinton, who discussed "The Power Machine in the High School," and Mr. Hubert Corder of Welton, who spoke on the subject, "What's Wrong With the Home Mechanics Course?"

Hold Fifth Conference on Efficiency in Public Schools. The fifth conference to increase the efficiency of the public schools of Las Animas and Huerfano Counties, Colorado, was held October 9th and 10th, at Trinidad, under the direction of the state and county school superintendents, with the cooperation of the Colorado Fuel and Iron Company. The meeting was divided into five sessions, taking up such phases as the public school as big business, in which the management, the workers, the raw material, the finished product and the market for the product are studied. Supt J. F. Keating of Pueblo, discussed "The Public School as Big Business"; Dr. Arthur F. Payne, formerly with Columbia University, New York City, talked on "Raw Material"; Prof. A. C. Cross of the University of Colorado, talked on "Care of Our Raw Material"; Dr. Mary C. C. Bradford, Denver, gave an address on "What the Stockholders Owe the Workers"; Supt. J. H. Risley of Pueblo, talked on "The Product: Finished and Unfinished," and H. A. Tiemann of Fort Collins, discussed "Salvaging the Unfinished Product."

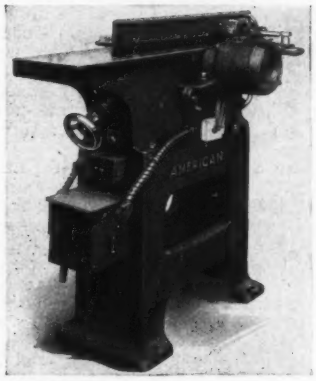
Will Study Industries. Vocational counselors in Cleveland (Ohio) schools, advising pupils what industries to enter after completing school, and what courses to study in preparation for that industry, will perform that work in the future with a definite knowledge of the various occupations that elementary and high school pupils may enter.

Miss May R. Lane, now with the Bureau of Research as supervisor of occupational research, will study the city's industries and compile information for the use of the vocational counselors. Miss Lane will also develop information for a course in occupations for vocational guidance.

Baltimore Industrial Teachers Meet. The first meeting of the Industrial Teachers' Club of Baltimore, for the school year 1925-1926 was held October 2nd, in the Forest Park Senior High School. Mr. Paul C. Edwards acted as chairman of the meeting. At the meeting, the principal address was given by Mr. B. T. LeLand, State Supervisor of Industrial Education, who talked on "The Teacher in His School."

Hold State Vocational Conference. A conference on vocational education for the state, university, and city supervisory and teacher-training staffs was held October 3rd, at Baltimore, Md. The meeting was divided into seven different divisions relating to phases of the vocational work, together with a summary of the problems for 1925-1926 by J. C. Wright of the Federal Board for Vocational Education. Among the important speakers were

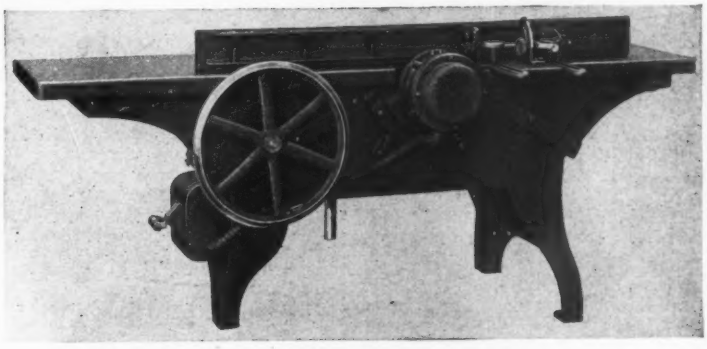
(Continued on Page 24a)



American No. 1 Bench Jointer

Knowledge Gained on American Machines will never Desert You

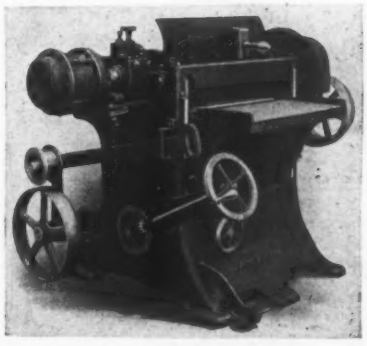
Training in Shop Practice should always be done on real shop machine.



American No. 1 Buzz Planer and Jointer

American Machines spring from the highest requirements of the industries. They are industrial machines.

"The tools of school are the tools of life"



American No. 1½ Single Surfacer

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Educational Department

ROCHESTER, N. Y.

Why it is easy to sell Walnut

Sentiment

The beauty of the American Walnut tree, and its usefulness, are deep rooted American traditions. Every boy and girl remembers with a thrill "nutting days" and grandfather's story of the walnut tree.

Pride

When the women "visit" and discuss the "homey" and intimate things, the ownership of walnut furniture is a source of pride and satisfaction. "My walnut" justifies with its beauty and enduring worth the honest pride of ownership.

TRADITIONS woven about American Walnut are powerful influences which furniture men do not always consider with proper appreciation. They are worth millions to the furniture industry. Walnut's traditional durability, stability and reliability are deeply rooted in the public mind. The beauty of walnut speaks for itself. The sentiment for walnut has played its part in fostering the great vogue for walnut furniture that has made it the most popular cabinet wood of the age.

"This Is the Walnut Age"

Our book "The Story of American Walnut" will make selling walnut furniture easier. It is full of fascinating facts about this premier among fine woods. Ask for it.

AMERICAN WALNUT

American Walnut Manufacturers' Association

Room 1236, 616 South Michigan Avenue

Chicago, Illinois

(Continued From Page 22a)

State Director J. D. Blackwell, who talked on state administration of vocational education; W. S. Small, who talked on teacher training, and Geo. M. Gaither, who discussed activities of the state society for vocational education.

Manual-Arts Course for Teachers. Manual training and fine arts teachers of Paterson, N. J., were recently enrolled in a special course providing the necessary points for advancement. Under the rules of the board, manual training teachers in order to advance beyond the salary of $1,900, must have taken at least one thirty-hour course of college work, and to advance to the maximum, must have completed a 240-hour course. The present is a 34-hour course and carries the usual two-point college credit.

Open Evening Trade School. An evening trade school designed to offer special trade instruction has been opened in the Manual Training High School at Denver, Colo. The school is conducted under the direction of the board of education and offers a varied selection of trade courses intended to supplement the day-time employment of the student and to increase his efficiency. Among the subjects offered are wood and stone carving, architectural drawing, freehand drawing, mechanical drawing, electrical construction, machine shop practice, printing, plan reading and estimating, sheet metal pattern drafting, shop mathematics, steam engineering, carpentry and joinery, cabinetmaking, patternmaking, woodturning and welding.

Evening Vocational Classes for Men. Evening vocational classes for men in the skilled trades have been opened in the various centers operated by the Essex County Vocational Schools, West Orange, N. J. At the boys' school, Valley Road, courses are offered in the subjects of machine and tool making, automobile mechanics, mechanical drafting, electricity, and carpentry. Courses are adapted for apprentices and journeymen in the trades, and are open to boys and men over 16 years of age, who are employed during the day.

In addition, a course for advanced mason apprentices is offered at the Essex County Continuation School, West Orange. The subjects offered include blue print reading and sketching, trade mathematics and similar subjects.

Open Vocational Training School. A vocational training school has been opened in the high school at Asheville, N. C., under the direction of the principal. Courses for patternmakers, brick masons, mechanical engineers, electricians, and carpenters are offered. The local building trades council cooperates with the school authorities in the enrollment of its members.

Two Vocational Training Classes. Two classes in mechanical drawing and printing have been established in the high school at Newport News, Va. The former drew an enrollment of thirty students, while the latter attracted 24 students.

New Evening Courses. New courses in elementary mechanical drawing and showcard writing have been added to the evening courses offered in the high school at Valley Falls, R. I. Certificates are presented to all students completing the work of each course, and who are present 75 per cent or more of the time.

Southern School of Trades Opened. A school of trades and industries was recently opened at East Gadsden, Ala. The school is a state-endowed institution, created for the training of craftsmen. It offers instruction in the skilled trades of carpentry, cabinet making, bricklaying, printing, engineering, mechanics, and auto mechanics.

Working Children Required to Attend. Children of the East Liverpool, O., public schools who have passed the seventh grade, and are 16 years of age, and possess working certificates, are required by the state law to attend continuation school until they reach the age of 18 years.

Maine Industrial Teachers Hold Meeting. The elementary industrial teachers of Maine held a meeting on October 29th, in connection with the state teachers' meeting. There was a discussion of a basic course of study to be derived as a result of thirteen regional conferences, also an analysis of one or more of the important topics. Among the speakers were Mr. M. M. Proffitt, specialist in industrial education of the United States Bureau of Education, who spoke on the topic, "Vocational Education in Trade and Industry in Small High Schools."

Course in Vocational Drawing. A course in vocational drawing is being offered each Saturday morning in the Museum of Fine Arts at Boston, Mass. The course covers a period of eight months and the sessions are three hours in length.

(Continued on Page 27a)

"That's done *right!*"

IF a boy can drive home a screw *right*—and always wants to do it *just that way*, he's got a starting point on life. He's achieved a sense of sound workmanship.

Poor tools balk, good tools help build that passion for getting things done right. For three generations Millers Falls tools have delighted the men or boys—who take pride in the work of their hands. They're good tools to grow up with.

We'd like to send you the new Millers Falls Catalog No. 39
—or special folders describing tools for vocational training.

MILLERS FALLS COMPANY, Millers Falls, Mass.
28 Warren St., New York **9 So. Clinton St., Chicago**

Starrett

graduations are easy to read

One thing you'll find all mechanics agreed on—the ease and rapidity with which you can read any Starrett Tool.

Examine your Starrett Steel Rule for instance and see how plainly and distinctly it is marked. The Starrett Graduating Process (our own exclusively) cuts figures and graduations deep into the steel. No uncertainty about your measurements! Even under a powerful magnifying glass the markings are perfect. Also, the comparative lengths of the various lines and the weight of the lines help to make it easier to read ***accurately***.

Write for a free copy of the Starrett Catalog and you'll find the rule exactly suited to the needs of your work. Spring Tempered, Semi-Flexible, Heavy, Light, Stainless, Hook, Shrink, Blacksmith's, Carpenter's — they're all shown in the Catalog. Ask for No. 23 "CE."

THE L. S. STARRETT CO.
World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled
Steel Tapes—Standard for Accuracy
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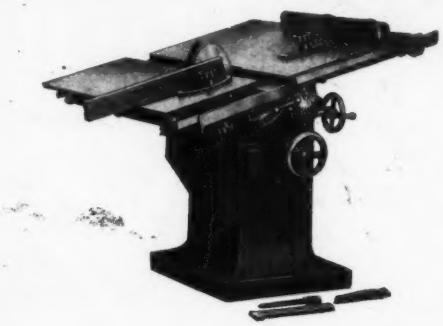


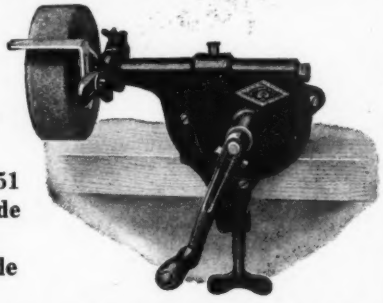
The No. 10 Crescent Saw Table is a sturdy, substantial machine with every convenient adjustment for general factory work and will meet every requirement for a practical saw table with self-contained motor for your manual training department.

Send today for circular giving complete description. Also ask for circular of band saws, saw tables, shapers, jointers, variety wood worker, planers and matchers, disk grinders, cut off table, swing saws, borers, hollow chisel mortiser, tenoner, universal wood workers, self feed rip saw.

THE CRESCENT MACHINE CO.
25 Main St.,
LEETONIA, OHIO.

Sharpen Edge Tools
on a LUTHER TOOL GRINDER

Ask for catalog and prices.



The No. 51 Best Maide is the Best Made

Manual training instructors, skilled mechanics, carpenters and pattern makers have found that Luther Grinders are the safest and most practical tool grinders made—excellent design and workmanship—a real quality product.

Grinder illustrated is our No. 51 Best Maide, ball bearing, swivel type hand grinder, equipped with combination (medium and fine) grinding wheel, especially adapted for grinding edge tools. No. 51 is equipped with 5x1½x⅞" DIMO GRIT grinding wheel and plain tool rest.

A special chisel and plane bit holding attachment can be furnished — insures uniform, accurate hollow ground bevel always.

LUTHER GRINDER MFG. CO.,
285 SO. WATER STREET,
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BISON BRAND GLUE

100% Adhesiveness

A superior adhesive manufactured by the same process as Pure Food Gelatine, under ideal climatic conditions. This process, and the careful selection of raw material, yields a glue of 100% adhesive matter.

The most vital consideration in buying glue is its keeping properties. The BISON BRAND being 100% pure, its keeping properties are guaranteed.

The unusual adhesive strength and penetrating qualities make it an ideal glue for all requirements of the woodworking industry and school shops.

Uniformity is guaranteed.

Liberal working sample submitted upon request, in Sheet, Flake or Ground form.

HENRY WILHELM COMPANY, INC.

134-136 Tenth Street **PITTSBURGH, PA.**

(Continued From Page 24a)

First Unit of Vocational School Will Be Completed. The first unit of the new vocational school at Dallas, Tex., will be completed the latter part of January. The building will house the building trades department and will cost $50,000. The school site contains thirteen acres of land and will eventually comprise a series of school units forming a complete school group.

Increased Enrollment in Vocational Classes. An increase of 25 per cent in enrollment in vocational classes in high schools and consolidated schools of Iowa has recently been reported by Mr. C. S. Sonnichsen, director of vocational education in the state. Last year there were 10,000 pupils enrolled, and this year there are more than 12,000 enrolled, with 1,400 cripples enrolled in rehabilitation work.

Evening Vocational Courses Announced. The evening vocational school at Mansfield, O., is offering courses in electricity and magnetism, machine shop practice, blue print making, shop sketching, and mechanical drawing. Each course covers 24 lessons, given two hours each week.

Exhibition of Art. An exhibition of contemporary art was held by representative American artists in the art gallery of the Inter-State Fair Grounds, at Trenton, N. J. The exhibit was a private view of art objects and preceded the regular opening of the Fair.

Study Hours on Practical Subjects. The Metropolitan Museum of Art, New York City, serves the producing art industries in two ways: by contact with factories, shops and designers; by contact with trade journals that reach these groups. The Museum also promotes socalled study hours to show people how to use the museum collections, and to give direct help in the problems of design and color. The study hours are supplemented by lectures and demonstrations on special subjects by people eminent in their special branches. The lectures are free and are given for the benefit of artisans engaged in crafts demanding artistic study, as expressed in the contents of the Museum of Art. The courses are arranged to be of help to sales people, to home-makers, to young girls, and to teachers respectively, and they take up such topics as principles of design and color, application of design and color, home furnishings, and graphic arts. In connection with the courses and lectures, illustrations are shown from the Museum collections—objects in the Museum, lantern slides, photographs and books.

The Museum also holds an annual exhibition to illustrate how the trades use the Museum sources and services, the objects shown being representative of the best work produced in the various industries. The Museum maintains an active contact with 500 firms and individuals and with 150 trade journals.

New Part-time School. Pittsburg, the city of many industries in Contra Costa County, Calif., opened its part-time school with 150 boys and girls this fall. George Engs is coordinator and instructor in trade work.

Extension Courses in Agriculture. The Alabama State Board of Education has made a departure from its regular plan in giving instruction in vocational education by adding to two of the state secondary agricultural schools, experienced agriculturists to conduct unit-course instruction in all-day schools and evening instruction to adults in centers near approved schools.

The instruction will be organized in certain large type rural schools in Clay and Marion counties, and the program will embrace work for pupils in all-day schools, out-of-schools, over-age boys, and evening school for adult persons.

The plan is intended to reach old and young farmers already engaged in the business of farming, making effective vocational training for adult farmers, supplementing the evening program being carried on in more than fifty centers of the state.

Evening Textile Classes Formed. The Handley Mfg. Co., at Roanoke, Va., through its resident agent, is offering an evening textile course for employees of the company. The course is intended to provide training for the employees, permitting them to better perform their work and at the same time lay a basis for advancement in textile work as the opportunity presents itself.

SPHINX - The Standard Table of Drafting Rooms

F.W.CO. SPHINX DRAWING TABLE
(REAR VIEW)

There is no lost motion in working on a Sphinx Drawing Table. Right at your finger tips there is a place for everything. A movable platform holds pencils, inks, and instruments. While a drawer and a commodious box care for your tools when not in use.

The Sphinx Table, while adjustable, stands as firmly as though it were fastened to the floor. Its board is made of thoroughly seasoned white basswood. Its workmanship, like all Weber products, is the accomplishment of skilled cabinet makers.

Little wonder that architects and engineers have adopted it as the standard table in hundreds of the country's largest drafting rooms.

The Sphinx can increase the efficiency of your drawing room too. Write for circular. Address Dept. I.A., F. Weber Co., 1220 Buttonwood St., Philadelphia. Branches: 227 Park Avenue, Baltimore; 705 Pine St., St. Louis; 125 So. 12th St., Philadelphia.

WEBER

Drawing Instruments & Materials

Short Course in Boxing and Crating Offered. The Forest Products Laboratory, at Madison, Wis., held a short course in boxing and crating from September 21st to 26th, which attracted sixteen firms, manufacturing fourteen different lines of products. During the course, wooden boxes of all kinds—nailed, lock corners, and dovetail construction, wire-bound and metal-strapped boxes and crates of various sizes and designs were tested in the laboratory to demonstrate the relative effectiveness of the different types of construction.

Texas College Opens with Large Enrollment. The Texas Technological College at Lubbock, Tex., opened the fall session with an enrollment of over 750 students. Courses in textiles, agriculture, home economics, and engineering are offered in the college.

New Departments Installed. The fall session at Mertzon, Tex., opened with new departments in industrial arts and home economics.

Cooperative Courses in Agriculture. Cooperative vocational agriculture is being tried out by a group of neighboring schools in Texas, comprising Nixon, Stockdale, Gillett, and Smile.

Supplement Texas Vocational Fund. Plans have been made to supplement the vocational fund of Texas, which has been rendered inadequate by reason of the veto of an appropriation of $312,000 for vocational purposes.

Home Economics Clubs Hold Fourth Meeting. The Hidalgo-Cameron County Home Economics Clubs of Texas recently met for their fourth annual encampment and contests. Prizes and awards were made in clothing, food, and poultry. Winners in the contests received transportation for a trip and conference at the A. and M. College.

Shoe Repairing Course. The Memorial Junior High School, of San Diego, Calif., is offering a course in shoe repairing as a part of its curriculum. The course consists of ten lessons covering foot anatomy, grades of leather, classification of shoes, and the actual work of repairing. One unit of university credit is allowed for the completion of the course, and a state credential to teach the subject.

Texas Industrial Art Teachers Meet. The industrial art teachers of Texas held their annual meeting November 26th to 28th in connection with the meeting of the State Teachers' Association. Mr. T. A. Butler, Port Arthur, Tex., acted as chairman of the meetings.

Among the speakers at the meetings were Mr. S. A. Blackburn, of Denton, who spoke on "The Problems of the Industrial Arts Teachers"; Mr. L. N. Campbell, of Dallas, and Mr. R. V. Rust of San Antonio, who talked on the subject, "Mechanical Drawing as Related to the High School"; Mr. R. O. Small of Massachusetts, who took for his subject, "The Relation of Industrial Arts to Vocational Education;" Mr. Phil Peters of Austin, and Mr. M. R. Smith of Waco, who talked on the topic, "What Should the Junior High School Aim to Teach?"; Mr. N. S. Hunsdon of Austin, who spoke on "Progress of Industrial and Vocational Education in Texas," and Mr. M. R. Hughes of El Paso, who discussed "The Development of a Part-Time Program."

Vocational Courses Offered. The evening high school at Albany, N. Y., is offering courses in elementary drawing for mechanics, drawing for machinists, drawing for carpenters, architectural drawing, cabinetmaking, and electrical theory. In School No. 6, the course includes woodcarving, cabinetmaking, and patternmaking, while in School No. 25 work is offered in cabinetmaking, woodworking machine operation, mechanical and architectural drawing, printing, machine shop practice, and bricklaying.

The courses for women include cooking, dressmaking and millinery.

Trade Instruction Offered. Some sixty trade improvement courses are being offered at the Technical and the four evening vocational schools in Buffalo, N. Y. Wood and metal trades are taught at the Technical high school, Peckham, Elm and McKinley vocational schools; Elm specializes in automobile mechanics; Seneca has a complete course in the various branches of the electrical field, while McKinley offers such special lines as bricklaying, paper hanging and plastering.

A few specialties are taught in one school only, for example. in sign lettering and telegraphy. The Elm school offers a very complete course in printing, including instruction in linotype and monotype operation.

New Cooperative Class Started. The second cooperative vocational class was opened at the Anderson, Ind., high school in September. The class spends one week at the high school and one week at one of the local industrial plants. Only boys who have completed the first two

(Continued on Page 31a)

Merry Christmas

Brightening Up Christmas — With "Prang" Tempera Colors

YES, the new "Prang" Tempera Colors can brighten up even Christmas itself! They can brighten up Christmas toys and make posters and show cards doubly beautiful and attractive.

Teach your students to make the kind of holiday posters and show cards the business men are glad to buy. "Prang" showcard colors, you know, are not only in demand because they are based upon the standard spectrum, but also because their hues are more intense and beautiful than was ever before believed possible.

With "Prang" Tempera colors, it is a simple matter to mix any desired intermediate hue, or with black and white to produce all the tints, shades and grayed colors desired. They are luminous and brilliant, a joy to use, and a source of delight to the trained eye.

Write us for color card and folder on this fascinating subject. A one ounce sample jar will be furnished upon application.

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JOHNSON

GAS FURNACES

No. 118 Combination Bench Furnace.

Johnson Furnaces produce more heat quicker, with less gas, due to the Johnson Patented Direct Jet Regulator.

Do All Your Soldering Heat-Treating Metal-Melting Without the Use of a Blower!

No. 1 Soldering Furnace

Let us send you our complete descriptive catalog of Direct Jet Appliances.

JOHNSON GAS APPLIANCE CO. Cedar Rapids IOWA

Pacific Coast Representative

C. B. Babcock Co. San Francisco, Calif.

Marshalltown THROATLESS SHEARS

Hand Power Belt or Motor

Marshalltown Throatless Shears will take sheets and plates of unlimited width and cut curves of small radius in any direction.
Made in several sizes with capacity up to and including ½-in. boiler plate.
We have a size and style to suit your work.

Write today for our catalog and prices. Dept. FS.

Marshalltown Manufacturing Co.
Marshalltown, Iowa

Overlook This

and you overlook one of the best courses for Manual Training Workshops

A large number of the foremost schools in the country (public and private) have come to realize this fact and are teaching ***Sheet Metal Working*** in their Manual Training Department. They realize sheet metal is rapidly taking the place of wood in most every industry and mechanics knowing this trade are in great demand.

The work is healthful, the hours short, and pay ranks high among the best paid trades.

The initial equipment required costs far less than any other equipment you could install considering the results obtained. The supplies necessary to carry on the course cost very little.

We will be glad to furnish an estimate on sufficient machines and tools to cover your needs upon receipt of number of pupils to be taught.

At least send for literature on the subject.

BERGER BROS. CO.

"EVERYTHING FOR THE TRADE"

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PEXTO GUIDE No. 25A

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THE STANLEY WORKS — THE STANLEY RULE & LEVEL PLANT

(Continued From Page 28a)

years of high school are eligible for this work. In the third and fourth years they are placed in the factory to work every other week. Upon completion of the cooperative work, the boys are presented with high school diplomas and are recognized as journeymen tool makers. They are then considered capable of handling lathe and production work in the industrial plant.

Vocational Guidance Introduced. In the Blanchester, O., high school this year, special emphasis has been placed upon vocational guidance of the students. Through vocational guidance, the school hopes to help each student to solve the great problem of the future vocation. Information concerning the various fields of occupations, as well as details concerning a few will be offered. During the year, representatives of the industries, businesses, and professions will be solicited by the students for information concerning occupations and the qualities which make for success in them.

Vocational Courses Offered. The high school at Pawtucket, R. I., is offering courses in mechanical and architectural drawing, in addition to shop mathematics and woodworking. At the Slater Junior High School, work is offered in sewing, cooking, and millinery.

Open Placement Bureau. Under the direction of the board of education, a placement bureau has been opened at Hartford, Conn. The Bureau will assist applicants for employment and training as apprentices in masonry, painting, plumbing and printing trades.

No Delay in Erection of School. The school board at Buffalo, N. Y., has announced the work on the new Peckham Vocational School will not be delayed and that the building will be completed next fall. Excavation work on the building will begin as soon as the exchange of land sites with the New York Central Railroad has been effected. In the meantime, the city has rented additional rooms for school purposes until the completion of the building.

New Printing Equipment Installed. With the addition of three new linotype machines, a cylinder press, a job press with automatic feeder, a power cutting machine and power stitcher, the printshop at the Bryan Street High School, Dallas, Tex., has been greatly enlarged. Instruction in the printing trades is given both in the Bryan School and in the evening school conducted in the same building.

Building Trades to be Taught. The school board at Centralia, Wash., plans to extend its vocational program to include the building trades, including carpentry, bricklaying, painting, and plastering.

Propose New Vocational High School. Plans have been considered for the erection of a new vocational high school at Wheeling, W. Va. The school will take care of a rapidly increasing enrollment of students in the vocational classes.

New Vocational School. Construction work has been begun on a new vocational school at Rushville, Ind.

Evening Vocational Courses Offered. Free evening courses in machine shop practice, automobile shop work, mathematics and mechanics, mechanical drawing, show card and sign writing are being offered in the evening school at Charleston, S. C.

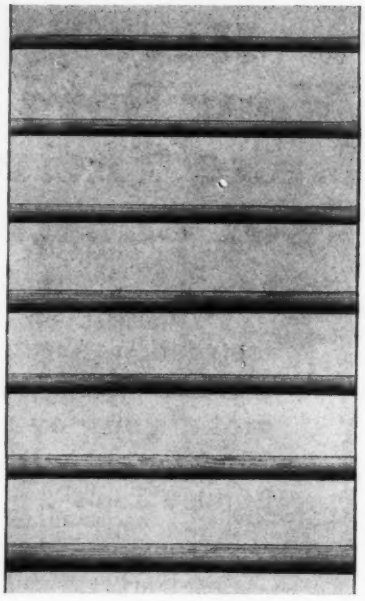
Large Enrollment of Vocational Students. More than 150 persons were enrolled at the opening of the evening vocational school at Fond du Lac, Wis. Among the subjects offered are millinery, cooking and sewing, machine shop work, automobile mechanics, show card writing, mechanical and architectural drawing, salesmanship and electrical work.

New Vocational School Opened. A new vocational part-time school has been opened at St. Petersburg, Fla., with an enrollment of 100 students.

Work on Manual Training Problems. The Freshman classes in manual training at the Gas City high school, Gas City, Ind., have begun work on such problems as a buffet, piano bench, library table and medicine cabinet. The eighth grade is studying the parts of a plane, its adjustments, kind, care, and use.

Furniture Making Added to Course. Advanced furniture making has recently been added to the woodworking course in the high school at Rochester, Minn. The work includes a study of home furnishings and instruction in modern adaptations of various styles in furniture.

Vocational Agriculture Offered. A course in vocational agriculture is being offered for the first time in the Snyder high school at Snyder, Tex. Projects in poultry



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Thurston Manual Training Supply Co.

Anoka *Jobbers and Manufacturers of "Hard-to-Get" Materials* **Minnesota**

husbandry and hog raising have been initiated. Shop work will become a part of the work as soon as a suitable shop can be provided.

Vocational Courses for Men. The evening school for vocational students opened at the Anderson high school, Anderson, Ind., with eight courses for men, four for women, and nine for mixed classes. The courses for men include machine shop work, welding, automobile electricity, commercial art and plumbing.

Organize Educational Institute. The Colorado Fuel and Iron Co. of Pueblo, Colo., has established an educational institute which is being conducted under the direction of the foremen's club of the Steel Works. The program has been extended to include nine centers in twenty mining communities, and follows a special survey and outline of the work by Dr. Arthur F. Payne of Columbia University, New York City. Classes are held four evenings each week and work is offered in related science, mathematics, commercial subjects, home making, machine shop practice, carpentry and mill work, and oxy-acetylene welding.

Establish Automobile Class. The board of trustees of the vocational school at New Bedford, Mass., has leased a large garage for use as a branch automobile school for students. A section of the building is partitioned off for classrooms and a small office.

New Vocational Courses. The school board at Centralia, Wash., has extended vocational education to include carpentry, brick-laying, painting and plastering.

Open Evening Vocational School. Approximately sixty men attended the first meeting of the evening vocational school in the Bloomington high school, Bloomington, Ind. Courses are offered in woodworking, stone-cutting and commercial subjects.

Indiana Home Economics Teachers Meet. The Indiana home economics teachers met with the American Home Economics Association, on October 1st, at Indianapolis, when a fine program of addresses and discussions was carried out. Dr. Mabel T. Wellman, of Indiana University, acted as chairman of the sessions. Among the speakers at the meeting were Miss Mary Beeman, state director of home economics education; Dr. H. L. Smith and Dr. Agnes E. Wells, of Indiana University, and Miss Ellen Miller, of the Merrill-Palmer School, Detroit, Mich.

Meeting of the Allied Art Section of Indiana Teachers. The Allied Art Section of the Indiana State Teachers' Association held its annual meeting on October 22nd at Indianapolis. Among the speakers were Miss May Robinson of Washington, Ind., who spoke on "New Objectives in Art Education"; Mr. E. E. Ramsey, state inspector, who discussed "The Need of Fine Arts in Secondary Schools"; Mr. Edmondson Hussey of Philadelphia, who talked on "Art in Industry," and Mr. J. O. Engleman of Terre Haute, who took for his subject, "The Ministry of Art."

Manual Arts Teachers of West Virginia Hold Meeting. The Manual Arts Division of the West Virginia Education Association held its annual meeting on November 6th at Huntington. Mr. J. R. Mulholland acted as chairman. Among the speakers were Mr. C. B. Myers of Huntington, who talked on "Art and Design in Manual Training"; Prof. E. S. Maclin of West Virginia University, who discussed "Curriculum Making in Manual Arts"; E. R. Borchardt of Charleston, who talked on "Woodwork in the Schools"; C. J. Gould of Huntington, who discussed "Sheet Metal Work in the Schools"; J. H. Thorp of Charleston, who talked on "Mechanical Drawing"; H. A. Lightner of Huntington, who discussed "Cabinet-Making and Productive Work," and W. A. Childs, who discussed "Shop Demonstrations."

All efforts were directed toward making the meeting contribute definitely to the extension of the educational value and influence of manual training. There were opportunities for visits to the local school plants, and a get-together lunch was given at one of the local restaurants.

Iowa Industrial Arts Teachers Meet. The Iowa Association of Industrial and Manual Arts Teachers met November 5-7, at Des Moines, with President William R. Baker, presiding. Among the subjects discussed were Acquaintanceship Courses, Teacher Conferences, Problems of the One-Man Shop, and Mechanical Drawing.

A DEPARTURE IN VOCATIONAL TEXTBOOK MAKING

American Vocational Textbooks. The American Technical Society of Chicago, Illinois, has published a new

(Concluded on Page 35a)

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28 striking colors, including Black, White, Silver and Gold, in 2 oz. bottles.

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RANGING in price from 40 cents to $1.00, and containing from four to sixteen colors each, the Bradley Water Color Boxes are invaluable for school art instruction. The boxes themselves are heavily enameled, with mixing tray in the lid. The colors are semi-moist, in pans. One or two good brushes are included with each box.

Although put up in economical form, these boxed colors are of high quality. They will wash and blend perfectly. The colors are always uniform, in each box of a given number, so that an entire class may all secure the same results, though using different boxes.

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No. 8098 — This assortment is made up of Red, Orange, Yellow, Green, Blue, Violet, Brown and Charcoal Gray. By mixing with white chalk a wide range of pastel shades may be secured. These crayons are unsurpassed for softening intensities of color in object drawing and design. Price, per box, 25 cents. Weight, 4 oz.

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No. 8261 — THIS is a clean, white powder which supplies a paste of great adhesive quality when mixed with cold water. It is a neat and economical way in which to prepare fresh paste for use as desired. In sifter top box. Price, per box, 15c.

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No. 8197 — These are the standard high quality wax crayons, packed eight colors to a box—Red, Orange, Yellow, Green, Blue, Violet, Brown and Charcoal Gray. They work smoothly, without bending or breaking, and are used for all branches of elementary art work. Price, per box, 15 cents. Weight, 3 oz.

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(Concluded from Page 32a)

catalog of American vocational textbooks for technical schools, high and junior high schools, vocational schools, evening schools, and part-time and continuation schools. Among the subjects covered by the various texts published are accounting, architecture, automobile construction and repair, building construction, business English, business law, electricity, forging, foundry work, drawing, law, mathematics, engineering, surveying, sheet metal work, steel construction, telegraphy, tool making, vocational guidance, etc. All texts are listed with prices and a brief description of their contents. The books are prepared from the instruction point of view in simple, clear language, profusely illustrated. The theory and principles are explained and demonstrated by practical application to modern industrial methods, and the books are, therefore, especially adapted to school requirements.

The Society has also announced the completion of a series of new Lesson Text pamphlets in electricity, auto mechanics and mechanical drawing. These are developed on the unit basis, fit a standard ring binder, and are fully illustrated. They fit into any carefully developed course and may be supplemented by the teacher's own job sheets, notes, etc.

TRADE PUBLICATIONS

Art Service Bureau Offers Help to Teachers. Binney & Smith Co., of New York City, have begun the third year of educational work through its Art Service Bureau, which offers practical help to teachers far removed from the large educational centers and lacking in concrete suggestions for actual class problems. The Bureau recently issued a typical Fall outline for suggestive art material, containing one suggestion each month for each grade, and involving one or more class periods. The ideas are arranged in squares, suitably illustrated, on a large sheet. They may be used interchangeably in the different grades and are well adapted to varying conditions. The problems presented do not represent complete art work but are planned with the idea of giving opportunity to do things involving the play spirit and the joy of color.

Information concerning the Art Service Bureau and its work may be obtained by addressing Mrs. Rose N. Kerr, director of the bureau, in care of the Binney & Smith Co., 41 East 42nd St., New York City.

Issue New Catalog of Manual Training Supplies. The National Manual Training Supply Co., of Minneapolis, Minn., has just issued its new 1925-1926 catalog of tools, supplies, furniture and cabinet hardware for use in manual training shops. The catalog illustrates and describes such items as upholstery supplies, leather supplies, lumber, cedar chests, picture frame moulding, wood specialties, cedar chest corners, furniture trimmings and hardware, bed equipment, tea wagon wheels, casters and corner angles, as well as a large list of tools for various purposes.

Teachers of manual training who are interested in these materials should address the National Manual Training Supply Co., at 120 South Eighth St., Minneapolis, Minn.

Issue New Catalog. The Thurston Manual Training Supply Company of Anoka, Minnesota, has issued its "Eleventh Annual Catalog of 'Hard-to-Get' Materials" for 1925-1926. The catalog describes and illustrates a very complete line of materials difficult to obtain. Many of the items are designed and manufactured by the Thurston Manual Training Supply Company only, and cannot be obtained elsewhere.

Among the various items listed in the catalog are the following: Art glass, burlap, bed equipment, braces, brackets, lamp fixtures, buttons, casters, clamps, corners, dowels, drawer glides and rollers, electrical goods, enamels, fillers, glue, hinges, knobs, lamp shades, leathers, locks, mirrors, mouldings, nails, needles, panels, plugs, reeds, shellac, silk cord and floss, sockets, springs, supports, tacks, trays, varnish, wax, etc. Complete decriptions and prices accompany all articles illustrated in the pamphlet. A special quantity price list is also included.

Copies of the catalog will be sent on request to all instructors or supervisors of manual training.

Issue Small Tool Catalog. The Greenfield Tap and Die Corporation, of Greenfield, Mass., has issued Catalog No. 49, describing and illustrating its entire line of small tools, including taps and dies, screw plates, twist drills, reamers, screw slotting cutters, gauges, pipe tools, bolt threading machines, etc. The catalog lists ground thread taps and spiral fluted staybolt taps, also a complete line of gauges, bolt and pipe-threading machines.

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The above products are described and illustrated in this catalog. Its 124 pages of instructive and useful information makes Catalog D a valuable reference book for the supervisor and shop instructor.

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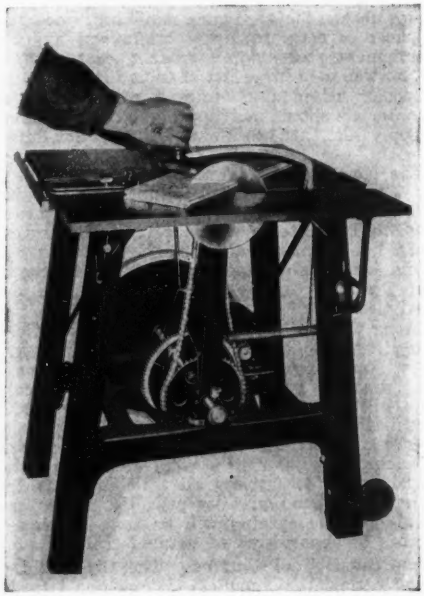
A feature of the catalog is a description of the spiral method of packing screw plates for the domestic trade. The method is advantageous to jobbers because of its time-saving feature, and is equally advantageous to the user because it means a quicker delivery and the assurance that the screw plate will arrive in perfect condition, without blemishes on the box and in as clean a condition as when it left the shipping room.

The catalog also contains a number of useful reference tables showing dimensions of hand taps and pipe taps, machine screw taps, tap drill sizes, ground thread taps, screw threads and pipe threads, cutting speeds, weight per inch, and decimal equivalents.

School shop instructors who are interested in the catalog may obtain copies by writing to the Greenfield Tap and Die Corporation at Greenfield, Mass.

New Catalog of Woodworking Machinery. The American Woodworking Machinery Co. of Rochester, N. Y., has just issued the fourteenth edition of its catalog of woodworking machinery. The catalog is intended for the use of industrial plants and school woodworking shops where various types of woodworking machinery are in regular use. The catalog illustrates and describes band saws, rip saws, jig saws, cut-off saws, motorized swing saws, arbor saws, dadoing machines, saw benches, planing and matching machines, single and double surfaces, bench hand jointers, moulders, rabbeting and jointing machines, mortising and tenoning machines, spindle shapers, pattern-making lathes, boring machines and drum, disk and spindle sanders. A full description of each machine is given, making the pamphlet very convenient for reference.

Silver Portable Electric Saw. The Silver Manufacturing Company of Salem, Ohio, has just placed on the market their new Silver Portable Electric Saw (No. 895) for rip-sawing, mitering and cross cutting. The saw is complete, with motor, and requires no special wiring and can be operated from the nearest light socket. The frame work of the Silver Portable Saw is a combination of iron and thoroughly seasoned hardwood, firmly bolted together. The entire outfit weighs only 180 pounds and can be easily wheeled from place to place by the use of heavy iron casters on the legs. Its width permits it to pass through any ordinary door. This new portable saw is a very useful piece of equipment for the school manual training shop. Its notable features are the following: It is portable, compact, powerful, rigid, accurate and inexpensive.



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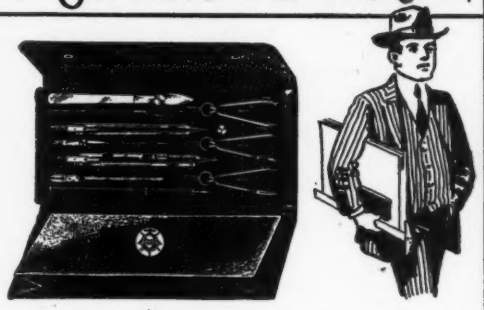

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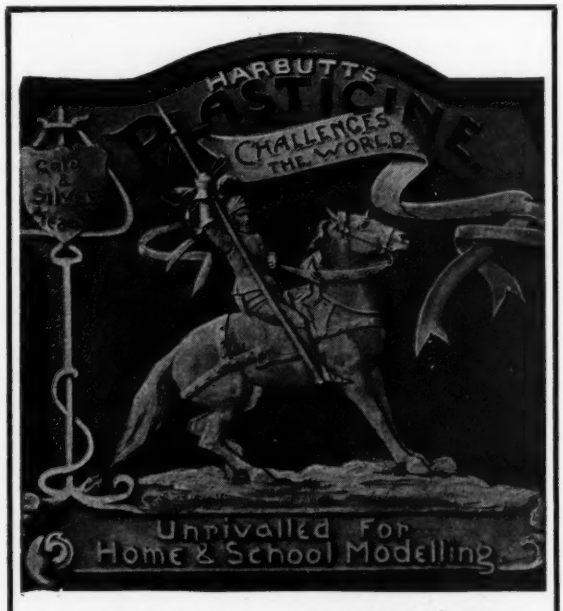

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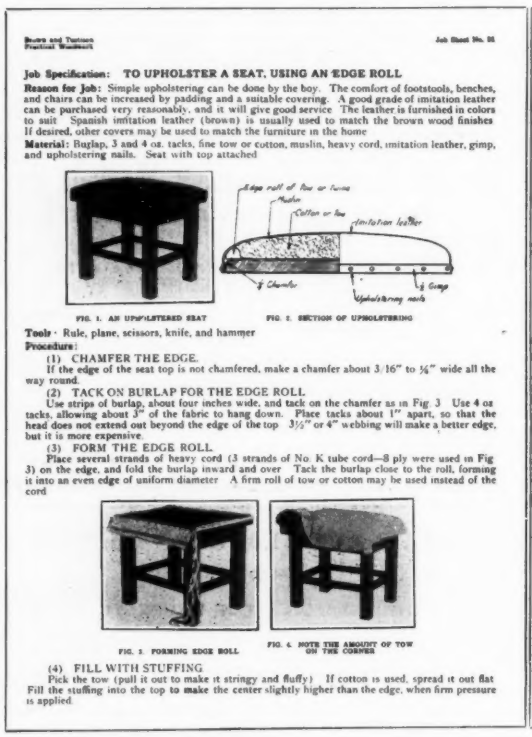


Boys and Tustison
Practical Woodwork

Job Sheet No. 16

Job Specification: TO UPHOLSTER A SEAT, USING AN EDGE ROLL

Reason for Job: Simple upholstering can be done by the boy. The comfort of footstools, benches, and chairs can be increased by padding and a suitable covering. A good grade of imitation leather can be purchased very reasonably, and it will give good service. The leather is furnished in colors to suit. Spanish imitation leather (brown) is usually used to match the brown wood finishes. If desired, other covers may be used to match the furniture in the home.

Material: Burlap, 3 and 4 oz. tacks, fine tow or cotton, muslin, heavy cord, imitation leather, gimp, and upholstering nails. Seat with top attached.

FIG. 1. AN UPHOLSTERED SEAT

FIG. 2. SECTION OF UPHOLSTERING

Tools - Rule, plane, scissors, knife, and hammer

Procedure:

(1) CHAMFER THE EDGE.

If the edge of the seat top is not chamfered, make a chamfer about 3/16" to ¼" wide all the way round.

(2) TACK ON BURLAP FOR THE EDGE ROLL.

Use strips of burlap, about four inches wide, and tack on the chamfer as in Fig. 3. Use 4 oz. tacks, allowing about 3" of the fabric to hang down. Place tacks about 1" apart, so that the head does not extend out beyond the edge of the top. 3½" or 4" webbing will make a better edge, but it is more expensive.

(3) FORM THE EDGE ROLL.

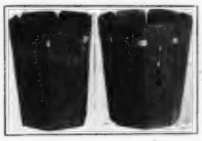
Place several strands of heavy cord (3 strands of No. K tube cord—8 ply were used in Fig. 3) on the edge, and fold the burlap inward and over. Tack the burlap close to the roll, forming it into an even edge of uniform diameter. A firm roll of tow or cotton may be used instead of the cord.

FIG. 3. FORMING EDGE ROLL

FIG. 4. NOTE THE AMOUNT OF TOW ON THE CORNER

(4) FILL WITH STUFFING.

Pick the tow (pull it out to make it stringy and fluffy). If cotton is used, spread it out flat. Fill the stuffing into the top to make the center slightly higher than the edge, when firm pressure is applied.



Boys and Tustison
Practical Woodwork

Job Sheet No. 18

Job Specification: TO MAKE A WASTE PAPER BASKET

Reason for Job: The waste paper basket is a useful household article. Such a project offers considerable opportunity for the boy to exercise originality in design. A new method of fastening is introduced in the suggested project. The following description applies to a simple design. Note the suggested variations, and incorporate some original ideas, if possible.

Material: 1" stock (S2S) for bottom, 5/16" x 6" for sides, ¾" brass strip No. 22, R. H. brass screws 1" No. 8, garnet paper.

Tools - Rule, dividers, saws, plane, brace and bits, hand drill, screw-driver, key hole saw, tinners' snips, mallet.

Procedure:

(1) DETERMINE THE SIZE AND DESIGN OF THE BASKET.

The drawings are for six and eight-sided baskets with plain panels. Note the figures for other designs. If any changes are made, make a sketch of the bottom and a side of the proposed basket. **Get a check by the instructor before proceeding.**

FIG. 1. BASKETS WITH MODIFIED PANELS

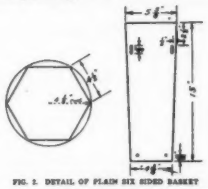


FIG. 2. DETAIL OF PLAIN SIX SIDED BASKET

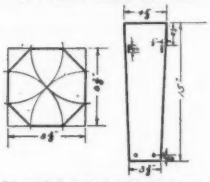


FIG. 3. DETAIL OF PLAIN EIGHT SIDED BASKET

(2) LAY OUT AND CUT THE BOTTOM (Six sides.)

If stock must be glued up, see Job Sheet No. 25. Draw a circle with the dividers, using the determined radius. Step off the sides of a hexagon on the circumference, using the dividers still set at the length of the radius. (See Fig. 2.) For laying out an octagon or eight-sided figure, see Fig. 3. Bevel the edges 1/16" for a tapering basket.

(3) LAY OUT AND CUT THE SIDES.

The width of the bottom of each side should be about ⅛" less than the dimensions of the bottom. Make one side carefully to dimensions. Use this as a pattern to make duplicate parts.

(4) BORE SCREW HOLES AND CUT THE SLOTS FOR THE BRASS CLIPS.

Bore holes for the round head screws which fasten the sides to the bottom. See the dimensions in Fig. 2. The slots are made by boring a series of 1/16" holes with a hand drill, and finishing with a keyhole saw.

FIG. 4. BASKET OF PLAIN DESIGN

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Warren P. Dayton,
Supervisor of Manual Arts,
Lodi, California.

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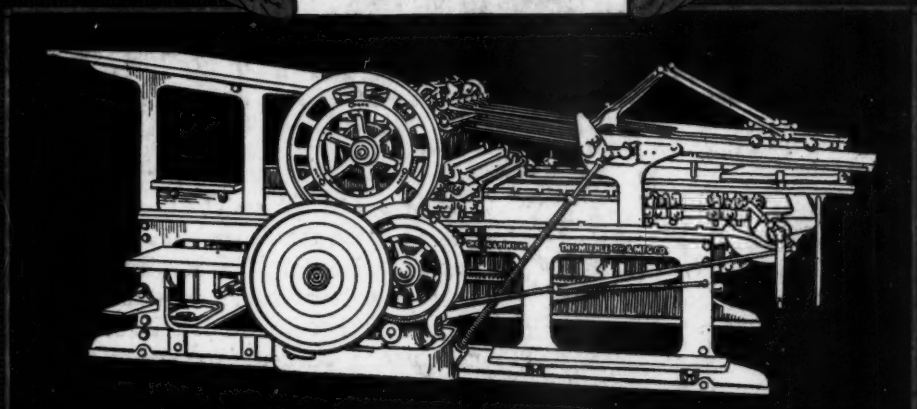

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LOST time on a Miehle is never due to any deficiency in the press itself.

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Lost time on a Miehle is always due to conditions outside of the press.

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INDUSTRIAL-ARTS MAGAZINE

E. J. LAKE S. J. VAUGHN
Editors

THE BARE TRUTH

One of the significant statements of Arthur W. Dow in his discussion of composition is "The bare truth may be a deadly commonplace." Mr. Dow, in his reserved but forceful way, was persistently warning his pupils against the commonplace. "Mere accuracy has no art value," writes Mr. Dow in his discussion of composition in representation.

Such insistence on the need of original thought and expression in our study and teaching of Art is a protest against the customary methods.

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The teacher of the Industrial Arts who confines his instruction to information of industrial interests and practice in remaking models already designed is never more than a trade teacher and under school conditions is usually a poor teacher of trades.

Every school project that is worth while must have some element of originality for the pupil.

The deadly commonplace of our American homes, towns and schools will not improve until the desire to create original effect is cultivated in our schools. Standards of originality must be established. Our arts of design have become so plagiarized that few recognize originality as of merit over a fair copy.

Our school exhibitions are collections of indifferent copies of designs published and printed and placed in the hands of pupils to imitate. Our teachers are most responsible in this plagiarism.

The continual cribbing of decorative schemes, pictures, designs and even the appropriation of entire schemes of design in school work has given us a perverted sense of art in relation to education.

Is it not possible to send each young person from the schools with that critical attitude of mind toward composition which impels them to realize and appreciate well related and beautiful effect?

Is it not possible to give each young person a glimpse into the world of Art which will give them the realization that Art is not a replica of exact measurements or a particular order of form but a reflection of personal and individual conception that is beautiful and valuable beyond price?

DO YOU REMEMBER WHEN?

There is no more effective way to realize the present than by recalling the past.

Do you remember when the artist of the class in Spencerian writing drew impossible, fantastic birds and deer with attenuated tails and legs? Do you recall the pride some gifted penman exposed in the map of our country bordered by waving lines that carried far out into the sea? Do you recall Pharoah's Horses rendered by the school prodigy in such realism that the livery man actually paid a dollar
office? The Stag at Bay an
yard of pansies and a ya
at the county fair no li
prizes and gave the fort
career.

Do you remember
pretty picture on one pa
opposite on which we
more or less success?
strong for that sort of
thumb prints that made
sary, but how some of th
The boys were handier wi
shop and after the routi
suit the boss, we were all
the lathe or make a chip
member how we glued n
other woods together in
light like a barber's pole
on the lathe? The poor
even had a foot-power sc
and made inlaid pretties

Then comes the mecl
rich boy got a bicycle for
he was and the most acrob
thing after a few headers o

The village blacksmith
weighed near to a hundred
fall that laid him up for a

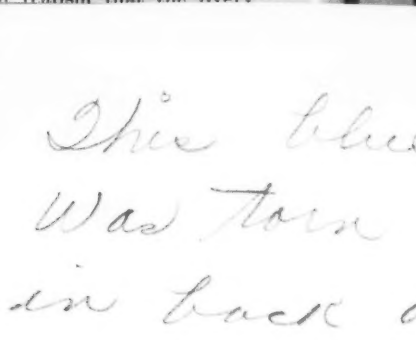
The little rich boy's
Spring and then the whole

Do you remember teac
lady how to ride a bicycl
teaching job you had and
career. Perhaps it also is
mechanics and your firm

Whether you rememb
ticular things they may be
old folks.

The historians of our
expose the exact chronolog

There was a time whe
the highest accomplishmen
Guido Reni's Christ head
beginning at the tip of the
round with a continuous str
cording the form of grief strick
thorns.



blue print
en out and
k of book.

Manual Arts Analysis and Lesson Plans

John R. Holliday, Richmond, Va.

IN TEACHING a trade, the first step in the teaching "job" is analysis; i. e., trade analysis. How far can we use these methods of trade analysis in the elementary manual arts field? The former is vocational education toward acquisition of skill, and that, applied to the earning of a livelihood, the latter a part of general education toward industrial intelligence. Has the "job" the same significance in the manual arts field as it has in the vocational field of trade analysis? The difference in the two subjects, then is evident, and it follows that different methods of analysis are called for.

In the manual arts field have we anything to analyze of the same type as that which vocational education has to offer?

Let it be considered that for the term "trade" we have the term "course," and for the term "job" we have the term "lesson." The trade is a course. But the course is not a trade. The job is a lesson. But a lesson is not a job. Do we plan the manual arts course, then, by analysis of a trade that is akin to our course?

I am endeavoring to give an idea of laying out an elementary manual arts course, not by analysis, but rather on the basis of finding lessons and building upon them.

Lessons contain something that has to be "put over." Eliminating all assumption as to what the boys know, the lessons are planned to take cognizance of every little piece of instructional information. I determine and number the lessons:

1. By the proper methods of procedure—to get their number.
2. By their learning difficulty—to get order for numbering.
3. By analysis of projects—to arrive at content.

Lessons are listed, and numbered in the following manner:

Lesson		Lesson	
1	Drawing	17	Painting
2	Standards and Conventions	18	Varnishing
		19	Enamelling
3	Bill of Material	20	Stenciling
4	Specifications	21	Patterns
5	Cutting our Material	22	Fastenings
6	Squaring Material	23	Gluing
7	Sizing	24	Dowel Joint
8	Chamfering	25	Butt Joint
9	Beveling	26	Dado Joint
10	Rounding edges	27	Rabbet Joint
11	Tapering	28	Cross lap Joint
12	Boring	29	End lap Joint
13	Sandpapering	30	Blind Mortise Joint
14	Staining	31	Miter Joint
15	Shellacing	32-38	Geometric Constructions, etc.
16	Waxing		

These lessons are written out on index cards 3"x5" for reference purposes only, one side used for instruction, the other for examples or drawings illustrating the lesson. (See sheet 2A for example.)

Care should be taken when writing out these lessons, so that the pupils may read and understand. An effort should be made to meet his intelligence. Owing to lack of space on the cards, the lessons should be expanded on the copy for the pupil's use.

These lessons are now mimeographed (say 25 copies for each lesson) on one side of good strong paper 8½"x11" in size, or thereabout.

Instructions are paragraphed, followed by knowledge of terms, examples illustrating the lesson, questions, and a place for references. (See example sheet 2b.)

These mimeographed copies of lessons are for the use of the boy, and, therefore, should be put in a file in an accessible place, with their numbers and titles plainly visible.

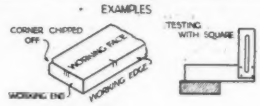
I am now prepared to meet my class on the first shop day in the term. After the preliminaries are over, which are typical of a first day appearance, the selection of projects is next in order. Let the boy select his own project aided by reference to books or magazines, blue prints in possession, or finished projects in the shop, and let the boy have his own project, because it is a factor of consequence in interest. In turn, when selection is completed, the boy reports at the desk, and makes known his proposed work. The project is discussed with the boy and carefully considered from the standpoint of educational and practical utility, difficulty, cost, etc. If approved, the project is then analyzed to determine the number and

FRONT

No. 6	SQUARING MATERIAL
INSTRUCTION	KNOWLEDGE OF TERMS, ETC.
Select best side for face.	Squaring in three steps
Plane straight from end to	1st Working Face I
end. Test with plane	2nd Working Edge II
length ways, and with square	3rd Working End III
from edge to edge mark I.	Winding Sticks
1st Step. Plane edge straight	Direction of Grain
and square from face mark II.	Plane and Square Test
2nd Step. Plane end square	
from working face and edge.	
Chip corner off a little on	
end way from working edge to	
prevent splitting mark III.	
3rd Step.	

BACK

EXAMPLES



QUESTIONS

1. How did you find out your planed surface was straight?
2. What position must your plane be in while in use?
3. What happens when you plane end wood? How do you avoid it? Where?
4. How many shavings do you take off to square up your working face? Why is it called working face?

REFERENCE:

SHEET IA.

LESSON GUIDE

Name John B. Smith Grade 6A Bench No. 5 Project Ring Toss

Read your project specification first.
Your Job contains the following lessons. You are expected to apply yourself diligently to the lessons herein contained.

Nos. 1 3 4 5 6 7 12 X 13.

Report to Instructor: When ready for next lesson after No 13 bring specifications with you

Total points on Lesson questions answered: _____

" " " Project questions answered: _____

" " " Workmanship: _____

" hours to complete project: hrs.; Total points:

SHEET 2C.

This is a beginners' class. Four projects suggested: Game Board, Ring Toss, Coat and Hat Rack, and Ring-a-Marble, all of which contain somewhat the same lessons. His proposed work is the making of a Ring Toss.

Lesson No. 6—Squaring Material

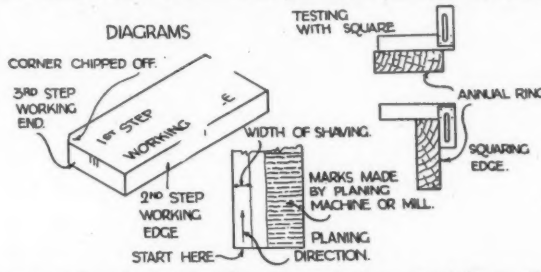
Instruction

You have your material cut out, and on your bench. You have learned how many sizes it has. How does it look; is it smooth? Is it square? Are all the sizes the same as those shown on your drawing? Would you measure from a rough side? What would be the result if you measured from a rough side, then smoothed and straightened that side off?

Your next job is to square your material, that is, smooth and straighten out three sides so that you can measure your three sizes from them. You do it in three steps. Take time and do each step correctly. Your bad or good work will be seen. The better you do it, the more pleasure you will have looking at it when your job is finished, when it is polished or painted.

Step No. 1

Select the best side; fix your material in the vise as you have been shown. Take your jack plane, start at the



near end and at the left edge and plane straight to the other end. Keep your plane parallel to your work. Take off two shavings, working with the width of the shavings toward the other edge. Study the pressures of both right and left hand when planing. Test for straightness lengthwise with corner of plane. Place plane on bench on its side. Why do you put it on its side? Test with square for straightness from edge to edge with the work in your hand, holding it up toward the window for light. When straight, write your working face mark on it. See diagram at the end of the lesson.

Step No. 2

Place your work in the vise edge up. Plane straight, and square from working face. Write your working edge mark II when finished. See diagram at the end of lesson.

Step No. 3

Fix work in vise end up with working edge next to you. Chip off corner a little with plane or chisel at edge that has not been planed working from edge to end direction. The reason you do this is to prevent it from splitting. Plane square from working edge and working face. When finished write on your working end mark III. See diagram at end of lesson. You have now squared three sides getting them into shape so that you can measure from them.

Terms or names you have learned and will remember

Squaring in 3 steps, 1st Working Face 1, 2nd Working Edge II, 3rd Working End III, Plane and Square Test for straightness. How much do you know about "Winding Sticks" and the direction of the grain?

Questions you answer on a separate piece of paper

1 How did you find out your planed surface was straight?

2. What position must your plane be in while in use?

3. What happens when you plane end wood? How do you avoid it? Where?

4. How many shavings do you take off to square up your working face? Why is it called working face, edge and end?

2B—Expanded Lesson Sheet for Boys' Use

name of the lessons contained therein. The same are written out on a slip of paper, called lesson guide, and attached to a sheet of drawing paper, given to the boy who is led to understand that one lesson at a time is to be taken out of the file, replaced at the end of the periods, and reporting at completion of each lesson (see sheet 2C).

The lessons are written in such a way that the boy is enabled to go through his work to the development of

2D—Project Specifications

Project

Good sport and pleasure may be had in the playing of the game, the object being to throw four rings made out of rope onto the base encircling the peg, or onto the peg if hung on the wall. Each player tosses four rings at a time, the score being counted with the number of rings successfully tossed onto the peg. The game is twenty-five or fifty points. This practice of tossing the ring gives you a good test for the eye in judging distances. On board the ocean liners the passengers play this game, and they get a good deal of pleasure out of it in competition with others.

In the making of the Ring Toss you will learn to square and size your material, to plane a chamfer, and to fit a peg. If you bore the hole to receive the peg first before you chamfer, it will make it easier for you to find the center. If you are using a square peg, shape the end round with a chisel the size of the thickness of the base, from the end of the peg. Cut the peg square in with the Back Saw where the round shape stops so that it will be a close joint when in position. When you have it nicely sandpapered, no marks to be seen, put a little glue on the sides of the hole all around with a small pointed piece of wood. Put peg in position, drive it down with the mallet. Wipe any glue off from that face that will show with a wet rag. The glue will be getting hard, and your Joint strong while you clean down your bench and get ready to stain or paint as you have decided to do. After staining or first-coating of paint, make your rone ring while your work is drying. When dry apply a coat of shellac or a second coat of paint, then continue on the ring making.

Answer the following questions

1. Do you bore before chamfering? Why?
2. How do you apply the glue? Where?
3. When do you put the peg in position?

SHEET 2D.

the project by himself. The lessons, which are to be demonstrated, are so marked in the index cards. Experience makes us familiar with them, and there is no need for a reference.

We have given the boy experience—how it is done. It is "up to him" to think out the doing of it. Strayer has said "the great work of teachers, to render our services unnecessary."

Projects being a unit of instruction, it will be found necessary to develop a specification patent to each project, enumerating reasons for the job, and procedure in construction. Questions are stated, for a test to be answered when finished or during intervals in the processes of finishing. (See sheet 2D).

Records of days absent, lessons and projects completed, and grades, are filed in a separate index. Indexed by grades or classes the same as you would have on a class roll. Cards 3"x5" are printed as shown in the diagram, both sides being used. (See sheet 3A).

3A ABSENTEE REPORTS

FRONT

Surname	Name	Bench No.	Grade	
Smith	Hank	5	6A	

REPORTS	Date
SEPT.	
OCT.	
NOV.	
DEC.	
JAN.	
FEB.	
MARCH	
APRIL	
MAY	
JUNE	

BACK

PROJECTS COMPLETED	Hours

LESSONS COMPLETED	No.

SHEET 3A. FRONT AND BACK.

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Do you remember when the artist of the class in Spencerian writing drew impossible, fantastic birds and deer with attenuated tails and legs? Do you recall the pride some gifted penman exposed in the map of our country bordered by waving lines that carried far out into the sea? Do you recall Pharoah's Horses rendered by the school prodigy in such realism that the livery man actually paid a dollar for it and hung it in his office? The Stag at Bay and a basket full of kittens; a yard of pansies and a yard of red roses; gave the judges at the county fair no little difficulty in awarding the prizes and gave the fortunate artist assurance of a great career.

Do you remember when our drawing books had a pretty picture on one page and a convenient blank page opposite on which we copied the pretty picture with more or less success? Of course we boys were not strong for that sort of thing and our copy often bore thumb prints that made our signature quite unnecessary, but how some of the girls did compete for honors. The boys were handier with tools in the basement woodshop and after the routine of joints had been made to suit the boss, we were allowed to turn a napkin ring on the lathe or make a chip carved jewel box. Do you remember how we glued mahogany, walnut, maple and other woods together in alternate strips of dark and light like a barber's pole and turned fantastic gew gaws on the lathe? The poor little rich boy of the school even had a foot-power scroll-saw of his own at home and made inlaid pretties out of cigar boxes.

Then comes the mechanical age. The poor little rich boy got a bicycle for Christmas. It was as tall as he was and the most acrobatic of us learned to ride the thing after a few headers over the big front wheel.

The village blacksmith made one that summer. It weighed near to a hundred pounds and he rode it to a fall that laid him up for a month.

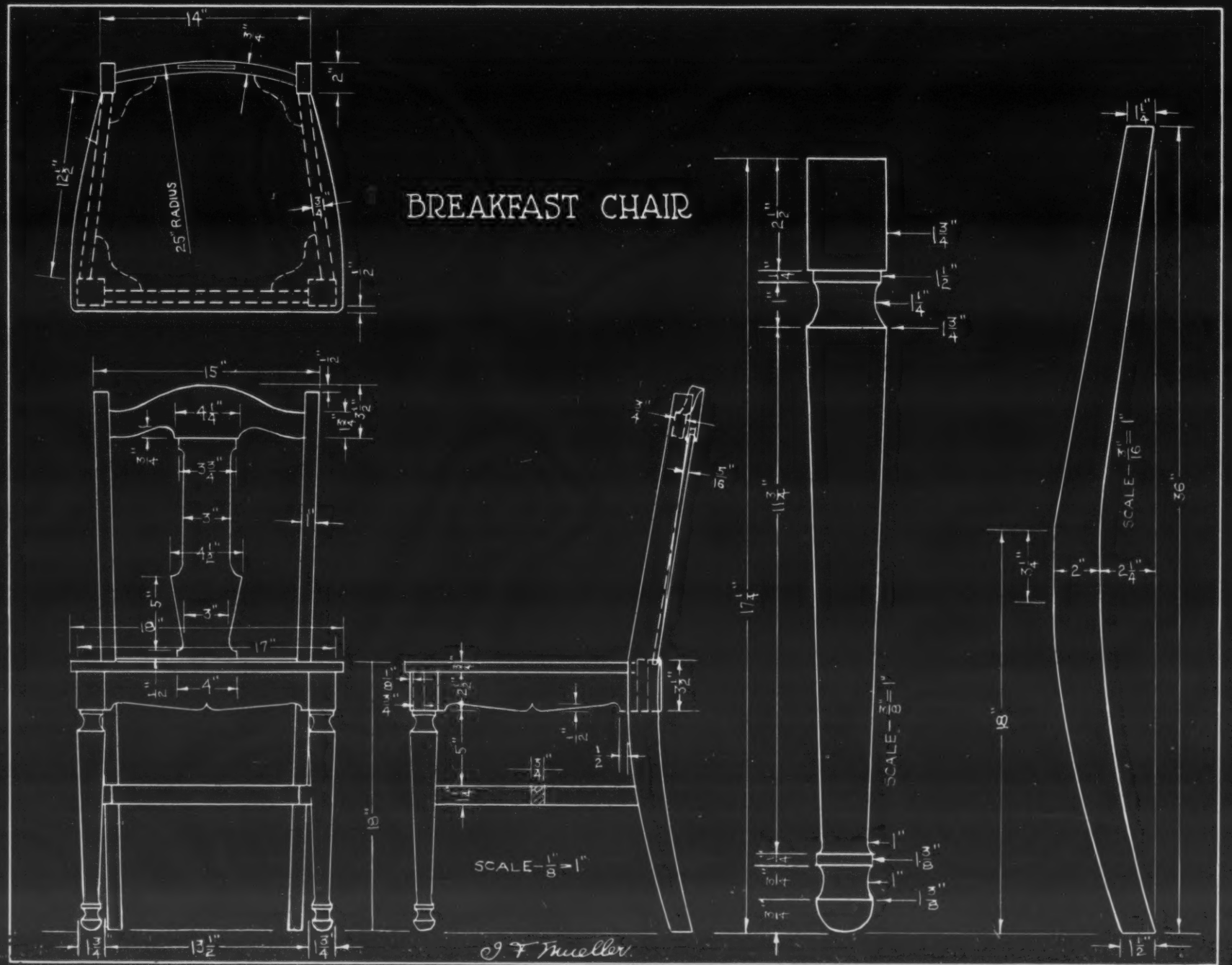
The little rich boy's father got a safety the next Spring and then the whole town went bicycle crazy.

Do you remember teaching a very particular young lady how to ride a bicycle? Perhaps it was the first teaching job you had and started you on a pedagogical career. Perhaps it also is the origin of your interest in mechanics and your firm belief in co-education.

Whether you remember any or none of these particular things they may be verified by talking with the old folks.

The historians of our Industrial Arts do not always expose the exact chronology of the subject.

There was a time when in the minds of our fathers the highest accomplishment of art was the drawing of Guido Reni's Christ head with one stroke of the pen beginning at the tip of the nose and going round and round with a continuous stroke of varying weight recording the form of grief stricken features crowned with thorns.


BREAKFAST CHAIR
14"
2"
12½"
25" RADIUS
1½"
15"
4¼"
3¾"
3"
4½"
5"
18"
17"
4"
13½"
SCALE-⅛"=1"
SCALE-1"=1"
SCALE-1"/16=1"
36"
J F Mueller

Bill of Materials for Breakfast Chair.

1—	1⅛" x 8"	x 37"—For Two Rear Legs.
1—	2" x 2"	x 36"—For Two Front Legs.
1—	¾" x 3"	x 16"—For One Front Rail.
1—	¾" x 6"	x 14"—For Two Side Rails.
1—	2" x 4"	x 30"—For Two Rear Cross Members.
1—	¼" x 5"	x 18"—For Rear Panel Strip.
3—	¾" x 1½"	x 16"—For Three Lower Braces.
1—	2" x 4"	x 12"—For Braces.
1—	¾" x 10"	x 36"—For Seat.

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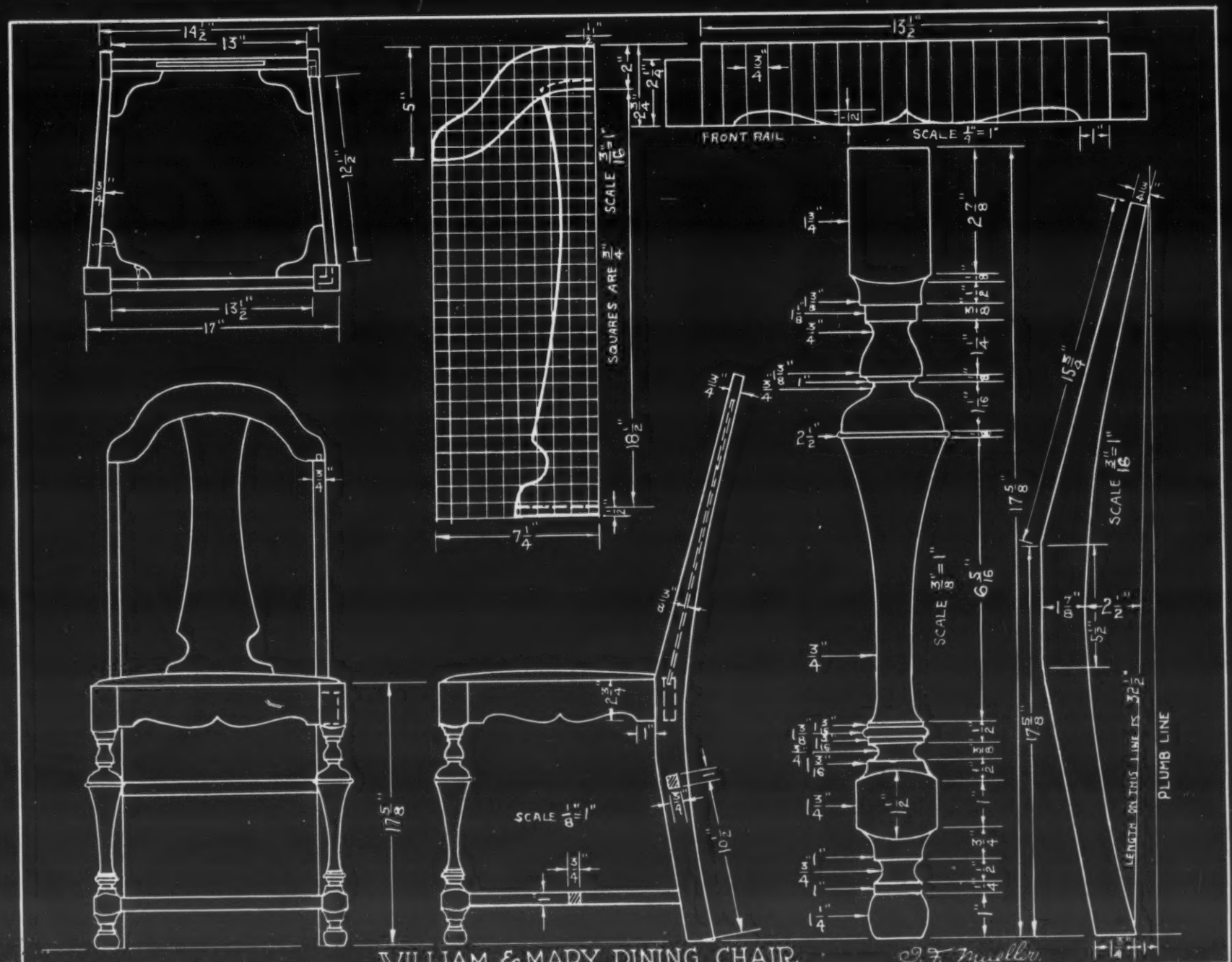
14½"
13"
12½"
13½"
17"
5"
SQUARES ARE ¾"
SCALE 3/16"=1"
2"
2¼"
2¼"
1½"
18½"
7¼"
13½"
FRONT RAIL
SCALE ¼"=1"
1"
4¼W
2 7/8"
1 1/8"
1 1/4"
1"
1 1/16"
2½"
15 3/4"
SCALE 3/16"=1"
17 5/8"
SCALE 3/8"=1"
6 5/16"
2 1/2"
1 3/4"
1 13/16"
1 1/4"
1 1/2"
1 13/16"
1 1/4"
1"
1 1/4"
17 5/8"
SCALE 1/8"=1"
2 3/4"
1"
1 1/2"
10½"
3/4"
1 3/4"
LENGTH OF THIS LINE IS 32½"
PLUMB LINE
WILLIAM & MARY DINING CHAIR
J. F. Mueller.

Bill of Materials for William and Mary Chair.

1—¾″ x 8″	x 33″	—For Two Rear Legs.
2— 2″ x 2″	x 18″	—For Two Front Legs.
1—¾″ x 3″	x 48″	—For Gluing on extra material for large bells on front legs.
1—¾″ x 3″	x 16″	—For Front Rail.
1—¾″ x 3″	x 30″	—For Side Rails.
1—¾″ x 3″	x 15″	—For Rear Rail.
1—¾″ x 6″	x 15″	—For Head Piece.
1—⅜″ x 6″	x 20″	—For Rear Panel Strip.
4—¾″ x 1¼″	x 15″	—For Lower Cross Pieces.
1— 2″ x 4″	x 12″	—For Braces.

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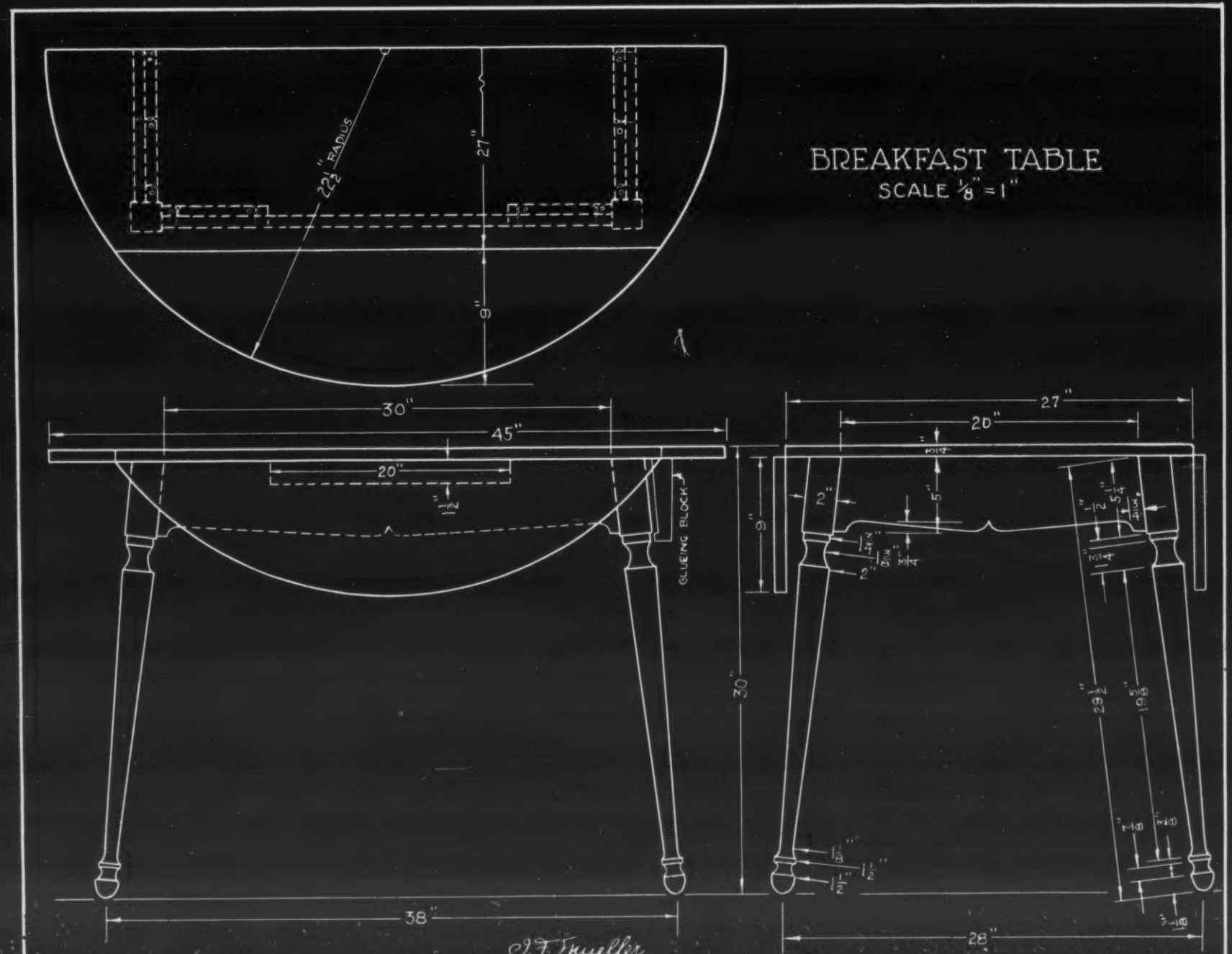
BREAKFAST TABLE
SCALE ⅛" = 1"
22½" RADIUS
27"
9"
30"
45"
20"
GLUEING BLOCK
27"
20"
2"
5"
9"
30"
38"
28"

Breakfast Set

I. F. Mueller, Industrial Arts Dept., Council Bluffs, Iowa.

This set is to be enamelled in desired colors. In view of this it would be better to select a wood fine in grain and smooth. Maple is excellent for the purpose, although hard to work. However, soft pine will do very nicely. Two inch thick corner braces, glued and screwed, together with the substantial rear legs will produce a strong chair, even in pine. The four chairs should be made on the production basis; that is, make all the legs at one time, then all the stretchers, etc.

After squaring up the front legs make a marker for turning. This will be a flat stick about eighteen inches long, through which brads are driven at all dimensions down the leg. The use of such a templet insures having the legs all alike.

Tenons into front legs should have a one-half inch shoulder on the top side, but none on the bottom; tenons into rear legs should have only side shoulders, thus giving added glue surface and strength. The curved pieces are cut on the hand saw of two-inch material, the cut offs are sawed and used as sandpaper blocks for sanding same. Be sure to cut the tenons on curves before sawing round.

In gluing up, do not attempt to glue up too many joints at one time. After front and rear sections are glued, glue in lower cross brace and the four front tenons, setting in the rear four tenons without glue, and clamp. Later, glue in the rear tenons. It is suggested that the corner braces be of two-inch material well fitted and glued, and when dry, screwed each with four screws. Do the boring and countersinking into braces before gluing, as this will greatly simplify matters. Immediately after gluing, wash off excess glue with hot water; this will raise the grain some, but it is much easier to do a little sanding than to scrape off a lot of hard glue, especially on turned parts.

The table needs little explanation outside of the slant cut on stretchers and the gluing blocks. A practical method for the slant cuts is to use the framing square. The vertical leg height is 29¼ inches, and the legs project outward three inches, so the slant cut is 3 to 29¼. Because the square is not 29 inches long it is necessary to reduce the ratio, say to 1½ and 14⅝; cut on one and one-half, using the top edge of the stretcher as straight edge.

Use of the gluing blocks, as shown on the drawing, will keep the clamps from slipping, and marring work, when gluing stretchers into the legs.

Bill of Materials for Breakfast Table.

4—	2¼" x	2¼" x 30"	—For Four Legs.
1—	¾" x	6" x 48"	—For End Stretchers.
1—	¾" x	6" x 68"	—For Side Stretchers.
2—	¾" x	2" x 21"	—For Leaf Supports.
1—	¾" x	1" x 84"	—For Top Screw Strips.
2—	¾" x	10" x 38"	—For Two Drop Leaves.
5—	¾" x	6" x 46"	—For Main Top.

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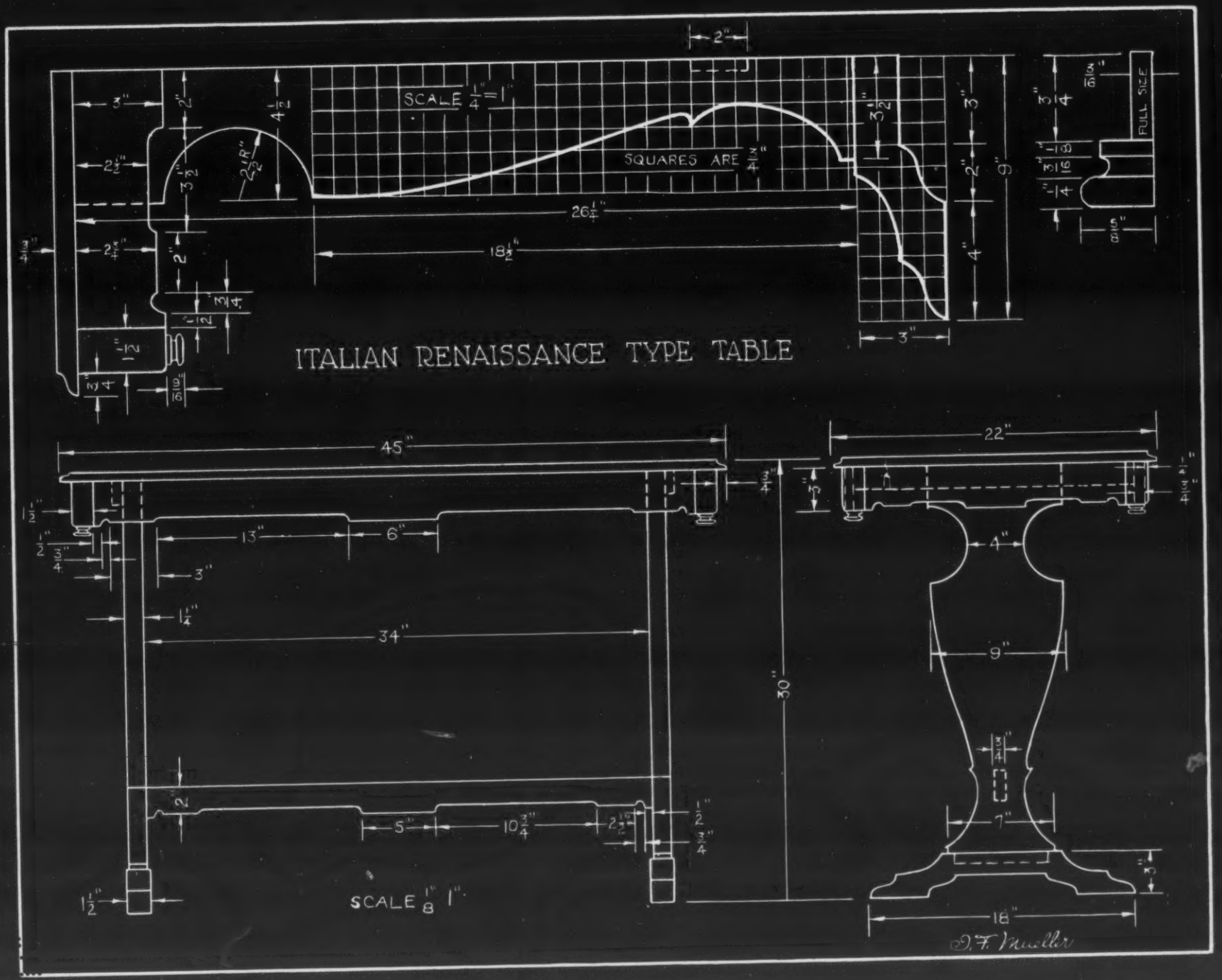
SCALE 1/4" = 1"
SQUARES ARE 1/4"
FULL SIZE
ITALIAN RENAISSANCE TYPE TABLE
SCALE 1/8" = 1"
D. F. Mueller

Bill of Materials for Renaissance Table.

2—1¼" x 10" x 28"—For Two Pedestal Legs.
2—1½" x 3¼" x 19"—For Two Pedestal Bases.
1— ¾" x 2" x 36"—For Lower Cross Member.
2— ¾" x 3½" x 43"—For Long Stretchers.
2— ¾" x 3½" x 20"—For Short Stretchers.
1—2" x 2" x 20"—For Corners and Knobs.
2—1" x 2" x 18"—For Crossbars Under Top.
3— ¾" x 8" x 46"—For Top.
1— ¾" x 3" x 15"—For Braces Under Top.

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There was a time when Manual Training consisted of making various knick-knacks of wood with the idea of developing skill of hand.

Now these operations have multiplied to include a variety of mediums, materials and educational purposes.

The thoughtless teacher goes about looking for new stunts and projects which may be added to the variety but with little conception of what it is all about. The thoughtful teacher adds to the variety of work attempted only when convinced that the project involves a desirable and necessary educational interest.

The distinctive educational interest of the Industrial Arts is the development of appreciation and judgment of well applied design. No one can become expert in many applied arts. A few may become expert in one but hardly that under school instruction alone.

All students can learn to recognize a variety of consistently planned and well executed things in school if they are taught a few underlying principles such as balance and harmony by a teacher of ability. While the doing of a fine job and the making of a choice object may be the incentive of the pupil it is not the whole purpose of the teacher. The teacher must see to it that the pupil develops appreciation and judgment. This may be done by making only a few of the many things that are now attempted under the Industrial Arts.

No program can keep pace with the increasing variety of occupations.

No teacher can afford to attempt many kinds of work.

THE LIFT OF INHALATION

There is a theory that fine art is dependent for vitality on a certain expression of respiration. A lift of the chest as it were, which is essential to the expression of energy and life.

We are inclined to question the invariable chestiness of works of art or of artists but we have experienced a decided intake of breath and a definite inspiration from works of art.

Moreover the coming Spring is the season for tonics.

Spring is also the season of large sectional meetings of teachers of the Industrial Arts. We all need this lift of inhalation, this tonic and inspiration that comes with meeting many workers in the Industrial Arts.

When we attend teachers' conventions the program often seems of least importance. We gather valuable hints from the exhibits.

We talk shop with the fellows and get samples of a lot of commercial products. We see a little of the schools and industries of the community. We have a good time but with a subconscious impression that the work is piling up at home. We are a bit uneasy with the feeling that the year's crop is not yet in the barn.

Have you ever been the victim of discipline that added insult to injury with the assurance that the executor suffered more than you? Have you ever told your class that they will get out of school just what they put in? The logical reply of the boy who is told that a whipping hurts his father more than it can hurt him is "Father forbid; I cannot see you suffer for my sins." The logical next question of the boy who is told that he will get out of school just what he puts in is, "What are teachers for?"

Convention programs are wasted by the indifference of teachers who are registered with the secretary but do not attend or take interest in the general meetings. The last meeting of the program of the Western Arts Association at Dayton was so good that local people turned out and with a few of the faithful members made a fair audience. The address was one that every teacher of Industry and Art should hear. So has it been with teachers' conventions from the beginning. The general program is made up of addresses by people who are often inspiring speakers with a distinct message and the ability to put that message over to the particular people who need it, yet the members for whom it was planned are conspicuously absent.

No organization of teachers can discipline its members.

The organization suffers by indifferent members and is sustained by a few faithful and persistent workers.

The faithful member gets much more than he puts in. He gets inspiration for better work and a reminder that the teacher must be inspirational as well as instructive.

The lift of inhalation has been known to lift otherwise ordinary plodders out of ruts and into high places.

PECK AWAY

"A woodpecker pecks
Out a great many specks
Of sawdust while making his hut;
He works like a nigger
To make that hole bigger
He's sore if his cutter don't cut.

He uses no plans
Of cheap artisans
But there's one thing can rightly be said,
The whole excavation
Has this explanation:
He makes it by using his head."

A right-minded boy
Will find it a joy
To work with his body and mind
If but one he uses
The boss soon refuses
An increase on payday to find!

Make use of your head—
Don't let it be said
Of you that you can't hold your own
You'd better "go to it"
Or later you'll rue it;
Fill your head full of brain—not of bone.

If You are right minded
You'll certainly find it
Worth while to develop your brains,
For if them you keep bright
You'll ere long have a right
In business to handle the reins.

—C. Neville Walker.

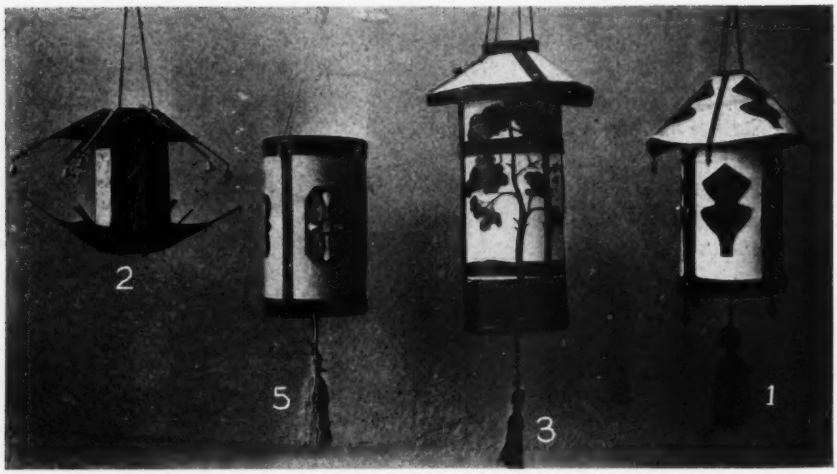


FIGURE 1.

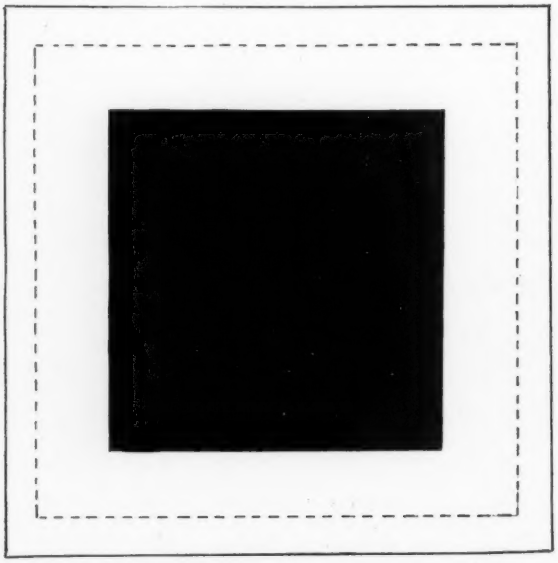
Lanterns That Make the Home Inviting

Richard Ernesti, Director Art Education, Colorado Springs, Colorado

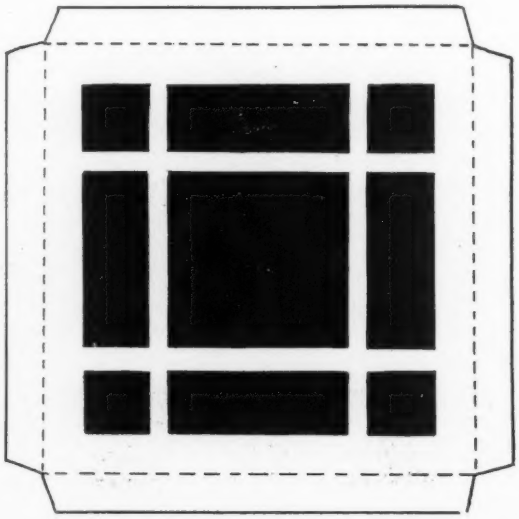
In my home there are many lanterns, many varied lights. We vie with each other (we are all art teachers) to see who can produce the most charming light effects, to make an atmosphere at all times cozy, agreeable, inviting to our friends and callers. And all these varied light effects, through lanterns, are the result of research in an effort to give our youngsters whom we teach in the grades, junior high and high schools something of interest, something to whet their appetites toward creation, something, anything to make *home,* to make the *world* the *life* more *beautiful.*

The illustrations in this article show various efforts. No. 1 is a class piece done in the Garfield school by a fifth grade, as a Christmas gift to the director of art. Of this style the schools produced something like two thousand last Christmas season, each one, of course, ornamented differently as the individual chose. The work was done in all the upper grades and while, no doubt, many have perished ere this, being only paper work on a base of oatmeal containers, still they have carried the message to Garcia.

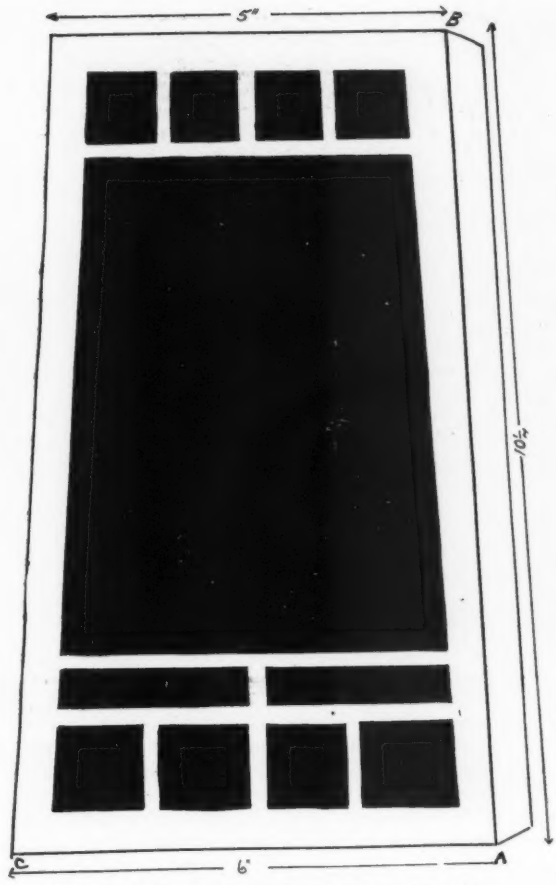
Nos. 2, 3, 4 are individual efforts of ninth graders and speak for themselves. No. 4, which is illustrated in separate drawings in detail, is made from Melton board, black preferable; the size is as given in the drawings and may be varied. It is a good hall lamp, and with care will serve for a number of years. The fasteners used are Rock Barnes round-head brass fasteners. These round-heads adding to the ornamentation considerably, make it possible to take it apart if necessary, and to replace



Top of Lantern—Crown folds rest against dotted lines. The black field measures 5", the dotted square 7", the outside square 8".



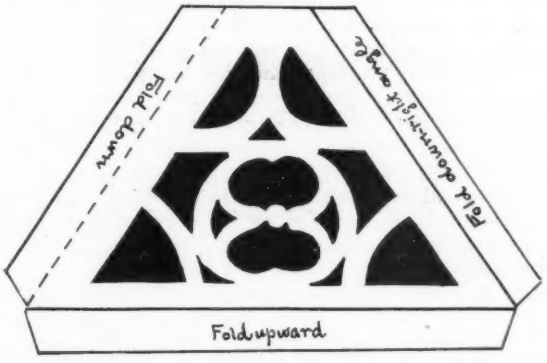
Score dotted lines, bent up to rest within sides at bottom flush with Line C.A. All black fields are cut out and covered on inside with Crepe Paper. The dotted square measures 6".



Cut four sides like this—Score and bend on line A-B.

papers or lamp in the socket. This particular lamp, or lantern. was done in orange and yellow, ranging from top to bottom nicely graded lemon yellow to deep orange crape paper. The metal ring on the top is made from a piece of metal band such as the steam fitters use to hold the asbestos cover on the steam pipes in buildings, and can be obtained from any plumber for nothing. It is bent around a broom handle or any piece of pipe the size of roundness depending on the judgment of the student. A hole is easily punched into the top of the ring to allow the cord of lamp to pass through.

While we make no claim for originality—there is nothing new in the world—the problem is one always inspiring, and the lantern is an article of service in



Make two crowns like this and two crowns with a folding flap at the bottom only. The crowns measure 6¼" at the base.

FIGURE 2.

almost any home. Here is opportunity for ingenuity in variation of form and certainly a chance in the use of color—a great mystery not yet solved.

The day is not far distant, when we will create through color illumination, atmosphere of every possible kind in our homes—cold, warm, or intermediate; cozy, charming, or repellent, as need may require. Daddy may be able to turn on a cold light from his study that will send homeward the undesirable caller at a precise hour. Who shall say *nay?*

Whatever the future holds in store for us in color discoveries, the constructive value of these lantern problems is ever new, and full of interest to children.

THE RUBBERIZED SCHOOLHOUSE

Laurence Parker, Kansas State Teachers' College, Pittsburg

We all are agreed that a rubber suit would be most comfortable to wear along about the time we go home to grandfather's to eat Thanksgiving or Christmas dinner. It would make that after dinner feeling such a comfortable one, don't you think?

Well, perhaps, if we could wave a fairy wand and make the walls of our schoolhouses of rubber, it would give comfort to some folks who just now feel very cramped indeed. This sounds very fanciful, but two Kansas communities have done that very thing and as a result of the process some boys are enjoying school for the first time.

The schoolmen in these communities were much troubled because they had large boys "in storage" in the fifth, sixth, and seventh grades. Perhaps, you have some of those good natured, awkward, slow-minded boys in storage in your schools. Perhaps, you are worrying about what is best for them and wishing you could afford to install an expensive "opportunity school" for them. These schoolmen had the same worry and the same inability to provide an elaborate training plan.

Then they hit upon the plan of rubberizing the schoolhouse walls so that it would take "all the cramp" out of the training of these boys.

This rubberization process is so simple that it was really a hard thing to think of in the first place and to realize in the second place that it would work.

The schoolman just called these big boys, one by one, into his office and got acquainted with them. Just found out what were their secret longings, their desires, and their ambitions. I expect that all took time and could only be done when the schoolman felt especially like a big brother to the big boy and had plenty of time. He never could have found out what he wanted by getting a vocational guidance questionnaire filled out by the boy. Just imagine filling out such a form yourself, and telling me about what you hope to do and to be.

Anyhow the big boy in each case showed a great interest in some line of work. One, perhaps, wanted to be a grocery clerk, another a radio manufacturer, another a plumber, another a shoe repairer, another a tire and battery repairman. After those interviews, no doubt, the schoolman wished for an opportunity school more than ever. His manual training department could not train these boys along the line of their interests.

Then, he rubberized the walls of the old schoolhouse in the easiest possible way. He just closed his roll-top desk and spent a few hours with the business men of the community. One by one he got men interested in half-day training of a big boy in his trade right there in his shop. All he asked was that the business man think of the big boy as a son or neighbor boy and give him a square deal, call the schoolman on the phone if he should fail to show up, and suggest to the manual training teacher any shop work, drawing or mathematics that would help the big boy to make a better workman.

And so, one by one, the big boys who really were interested in a trade and who were in storage, began dividing their day's work between the training shop of industry and the manual training shop of the schoolhouse. The plan works best where the business man runs a small establishment and can personally instruct the big boy.

And in this way, quietly, without elaborate surveys, questionnaires, or any publicity, the walls of that schoolhouse have been stretched to include several business establishments of the community and those big boys are now out of storage and in training for their life's work.

Design and Industrial-Arts Work

Richard E. McKenney, Jackson, Minn.

The disciplinary value which always accompanies accuracy in the manual training shop is one of the "carry-over" traits usually sought by the instructor. This article makes no attempt to minimize the importance of developing painstaking accuracy on the part of the student. However, if regarded as an end in itself, precision, with no thought for projecting the individuality of the student into his work, can result only in the abandonment of such work by the average boy. This article is concerned with how to secure personal interest, creative ideas and initiative, in addition to the well-established idea of accuracy.

Contrary to general opinion the average pupil can develop an appreciation and capacity for original design if opportunity is offered. Mr. Dean M. Schweikhard, state supervisor of trade and industrial education of Minnesota, has been working hard to develop the idea of general industrial intelligence. When this idea becomes firmly rooted in the minds of school authorities and patrons, the pupil's appreciation and respect for the trades will take on new color and meaning. There will be fewer attempts at turning out skilled carpenters in two years of high school work. Industrial intelligence, original design, spontaneous interest, initiative and accuracy will be included in the new interpretation.

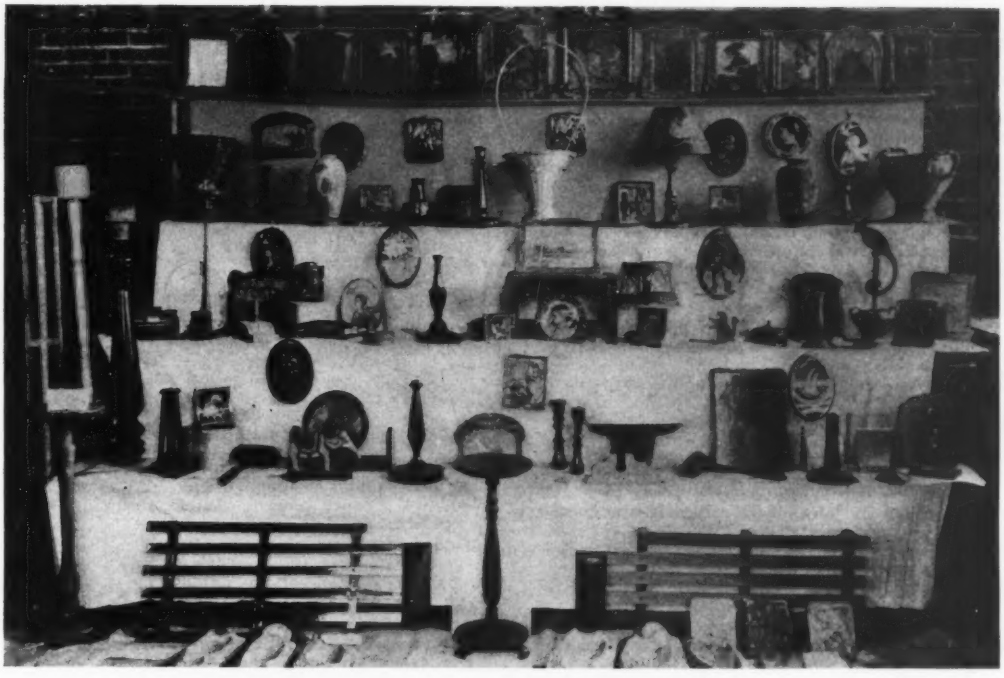
In the accompanying photograph, showing the work of the Jackson, Minnesota, high school students, wood turning, cabinet work projects, plaster moulds, plaster plaques, reed work, cement work, gesso work, and pottery are represented. Most of the work shown was done by students who had never attempted anything in the way of design.

The year's work was begun with a careful discussion of the elementary principles of design. Such procedure is almost imperative if the instructor is aiming at any real results. The students collected samples of both poor and good design to show the application of the principles discussed. In the Jackson schools these samples consisted chiefly of photographs of furniture, pottery, cement work, leather work, posters, foundry, etc. A poorly designed vase, a hideous piece of old mission furniture in the form of a footstool, several poorly designed candle-sticks, and even a grotesque and inefficient bird house were exhibited. The amount of interest developed by such lessons was of sufficient inspiration and encouragement to justify recommendation to any instructor.

The time taken for development of good design principles, discussion of good and bad merits of exhibits and sketches required about two weeks at the beginning of the first semester. This period also included discussions as to what forms of furniture, pottery, metal working, etc., would lend themselves particularly well to good design. Among the numerous things decided upon were book ends, medicine cabinet, flower box, serving tray, writing set, candle-sticks, lamp base, toys, bird houses, pottery, cement book ends, tiles, plaques, etc. During the third week, projects were selected, based mainly upon the student's interest. That which appealed to him as especially suited to both accurate measure and good design, was chosen. This period also included a careful plan of faces, or parts, to be designed and sectioned into one-fourth or one-half inch squares. This proved quite a task in accuracy for the budding designer, but with a good drawing board, a T square, and a triangle the problem was solved with a fairly good degree of accuracy. The next step in the third week period may be divided into four stages: First, an original sketch was drawn in sketch by the student; second, criticism and suggestions were made by the instructor; third, the original sketch was carefully redrawn; and fourth, a cut-out of pattern and tracing to be used on parts was selected for enrichment.

With these principles in mind the pupil discovers that he, too, has some originality within him. Hence, he puts forth his best creative effort. No amount of labor seems too great for him to spend in obtaining a surface suitable for the design.

The instructor must exhibit much patience with the budding designer until he or she can get the proper muscular control. This capacity is latent and presents itself, in most cases, to a far greater extent than is generally supposed. Contrary to traditional opinion artists are not "just born." Encouragement with the proper educative steps will often draw out this capacity in what seems to be the clumsiest boy. In many cases designs must be redrawn several times before being finally ac-



SOME OF THE PRODUCTS OF THE AUTHOR'S CLASSES.

cepted. These cases tax the patience of the instructor, but are surprising and favorable in results.

In the Jackson schools the idea of design was first introduced in connection with wood working. In the years 1923-1924 and 1924-1925 it has extended to the use of cement, clay, plaster, reed, gesso, and wood turning. Plans are being considered for the addition of metal work next year. In this way it is hoped to develop what the state department has properly styled industrial intelligence, as well as the industrial appreciation of the pupils.

Bookbinding, Repair, and Rebinding

Chat. A. Picken, Detroit

(Continued from February)

Exercise 6—Loose Pages

(a) "Tipping in." (See General Directions, Exercise 6, a.)

Equipment: Paper trimmer or shears, paste brush, bonefolder and weight.

Supplies: Plain paper, paste, newspaper.

Method of Procedure:

Cover desk with newspapers.

1. Repair leaves.
2. Strengthen sewed margin if necessary. (See General Directions, Ex. 6-b.)
3. Test leaf in book to see that it fits.
4. Apply paste to one-eighth inch of sewed margin.
5. Insert leaf in book.
6. Iron down inner margin.
7. Close book to dry.
8. If leaf extends beyond the margin of other leaves, trim when dry.

(b) Pages with a Hinge (See General Directions, Ex. 6-d).

Equipment: Paper trimmer or shears, paste brush, bonefolder, steel ruler, weight and waxed paper.

Supplies: Plain paper, paste.

Method of Procedure:

1. Repair leaf.
2. Paste hinge to inner margin.
3. Test leaf in book.
4. Apply paste to hinge.
5. Insert leaf in book.
6. Iron hinge down with the fold of book.
7. Insert waxed paper in the hinge.
8. Close book to dry.

Exercise 7—Repairing Corners of Covers

(See General Directions, Ex. 7-d)

(a) Vellum Corners.

Equipment: Shears, ruler, pencil, paste, brush, bonefolder and weight.

Supplies: Gummed vellum, 3" wide, newspapers to protect desks.

Method of Procedure:

1. Wash covers.
2. Cut vellum for corners.
3. Paste vellum on corners and iron well.
4. "Turn in" on edges and iron well.
5. Repeat in like manner on other corners, if needed.
6. Put under weight to dry.

(b) Pasted Corners (Corners repaired with paste only). (See General Directions, Ex. 7-e.)

Equipment: Shears, paste brush, bonefolder, weight.

Supplies: Paste.

Method of Procedure:

1. Wash covers.
2. Apply paste between folds of chipboard.
3. Iron down well.
4. Trim off any frayed places.
5. Rub any worn places over with paste to make a smooth surface on edge.
6. Put under weight to dry.
7. Shellac covers when paste is dry.

Exercise 8—Repairing Backs of Covers

(See General Directions, Ex. 7-a)

(a) Repairing back without removing covers.

Equipment: Shears, pan, sponge, bonefolder, copper wires and weight.

Supplies: Gummed vellum 3" wide.

Method of Procedure:

1. Cut vellum the exact length of book.
2. Paste vellum on back of book.
3. Iron down well.
4. Rub down the joints.
5. Set joints with coppered wires and put under weight to dry.

6. Stack. (See General Directions.)

(b) Repairing Back with covers removed.

Equipment: Shears, pan, sponge, bonefolder, coppered wires, waxed paper, auburn board and weight.

Supplies: Gummed vellum, 3" wide.

Method of Procedure:

1. Cut vellum about one inch longer than back of book.
2. Lay vellum on desk, the gummed side up.
3. Dampen vellum.
4. Replace book in covers.
5. Set back of book down in venter of the vellum.
6. Iron strips of vellum down on covers. Do this with the palm of the hand, so you will "iron" the back at the same time.
7. Remove book from covers.
8. Remove any super or loose paper on inside of cover.
9. Paste down any loose vellum.
10. Paste the one-half inch extending strips down on inside of covers.
11. Iron well.
12. Replace book in covers with double stripping. (See General Directions, Ex. 9.)

Exercise 9—Replacing Book in Covers

Covers broken at joint, book otherwise in good condition.

Equipment: Shears, paste brush, bonefolder, coppered wires, auburn boards, weight (bricks).

Supplies: Double stripping (two strips), paste.

Method of Procedure:

1. Remove super and any loose lining from covers.
2. Cut double stripping about one-fourth inch shorter than length of book.
3. Place the book in covers. See that the edges of the book coincide with the edges of the lining paper on the covers.
4. Hold the book firmly in place.
5. Lay top cover back.
6. Apply paste along the back of the book, along the joint, and cut on the first sheet for about one inch.
7. Lay the double stripping down on pasted part so the stitching fits well back into the joint. If the stitching is too far ahead the covers will not open well.
8. Rub down well.
9. Apply paste along the back and out about one inch on the cover of the book.
10. Close cover.
11. Iron well.
12. Rub down joint.
13. Test hinge.
14. Apply paste along the folds of each leaf to the center of the section. These leaves should be tipped together about one-eighth inch.
15. Insert waxed papers between cover and fly leaf.
16. Again rub down joint.
17. Turn book over carefully and repeat in like manner on other cover.
18. Set joints with coppered wires.
19. Place between auburn boards and put under weight to dry.

REINFORCING

Exercise 10—Reinforcing and Replacing Covers

Covers broken at joint, first and last sections loose.

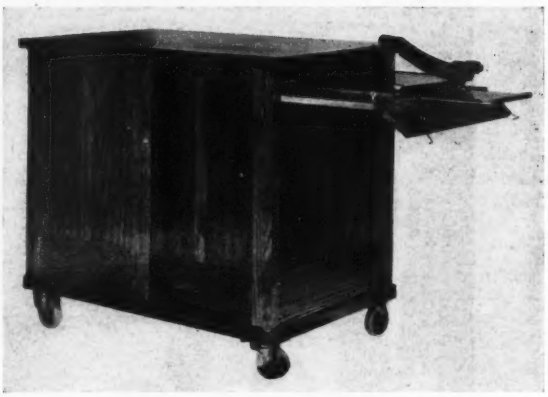
Equipment: Shears, awl, darning needle, paste brush, bonefolder, waxed paper, coppered wires, auburn boards and weight (bricks).

Supplies: Linen thread, double stripping, paste, cotton cloth.

Method of Procedure:

1. Remove super and loose paper from covers.
2. Cut two strips of double stripping one-fourth inch less than length of book.
3. Paste a one-half inch strip of cloth on the first leaf along the inner or sewed margin.
4. Punch holes for overcasting.
5. Overcast sections firmly in place.
6. Replace book in covers with double stripping.
7. Insert waxed papers between covers and fly leaves.
8. Rub down joint.
9. Set joint with coppered wires.
10. Put under weight to dry.
11. Line cover if necessary after joint is dry.

A MOVABLE WORK CABINET FOR SCHOOL BOOK BINDING DESIGNED BY MR. PICKEN AND USED IN THE DETROIT SCHOOLS.



BACK OF A MOVABLE CABINET FOR SCHOOL BOOK BINDING.

Exercise 11—Reinforcing and Repairing Backs of Books

Back needing repair, book loose from cover, and first sections loose.

Equipment: Shears, pan, sponge, bonefolder, coppered wires, darning needle, awl, paste brush, waxed paper, auburn boards, and weight.

Supplies: Linen thread, ½" strip of cotton cloth, double stripping, paste, gummed vellum 3" wide.

Method of Procedure:

1. Paste ½" strip of cloth on first leaf along the inner or sewed margin. Let dry.
2. Punch holes for overcasting.
3. Overcast sections firmly in place.
4. Repair cover. (All covers should be washed before repairing.)
5. Replace cover with double stripping.
6. Insert waxed paper between double stripping, or cord fly leaf.
7. Rub down joint with bonefolder.
8. Set joint with coppered wires.
9. Put under weight to dry.
10. Line cover if necessary after joint is dry.
11. Shellac covers.

Exercise 12—Strengthening Joints

(a) Covers Loose at Joints (See General Directions, Ex. 8-b). (Super loosening from covers, otherwise in good condition.)

Equipment: Marking brush, bonefolder, auburn boards, coppered wires, and weight (bricks).

Supplies: Paste.

Method of Procedure:

1. Apply paste with a long marking brush along the inside of the loose super.
2. Close book and rub joint with bonefolder.
3. Set joint with copper wires.
4. Put under weight to dry.

(b) Covers Loose at Joint—Lining Paper Broken (See General Directions, Ex. 8-a).

Equipment: Pan, sponge, paper trimmer, coppered wires, waxed paper, and weight (brick).

Supplies: Gummed cloth.

Method of Procedure:

1. Trim or pull off any loose paper at the joint.

2. Cut a strip of gummed cloth one inch wide and the exact length of book.
3. Paste a single strip of gummed cloth along joint, so one-half is on the cover, and the other half on first leaf.
4. Iron gummed cloth well back into the joint.
5. Close book.
6. Test hinge (General Directions, Ex. 8, Introduction).
7. Set joint with coppered wires, and put under weight to dry.

Exercise 13—Gluing Backs

When the super and stitching are in good condition, the super should be put back in its proper place.

Equipment: Glue brush, paper trimmer, or shears, copper wires, bonefolder, weight (bricks).

Supplies: Glue, gummed cloth.

Method of Procedure:

1. Trim or tear off any loose papers at joint.
2. Glue back of book along the sewing.
3. Close book.
4. Iron back well.
5. Rub the joints down with a bonefolder.
6. Set joints with coppered wires.
7. Put under weight to dry.
8. Paste single strip of gummed cloth along joint, rubbing cloth well back into the joint.
9. Test hinge.
10. Again put under weight to dry.

Exercise 14—Stabbed Sewing

When threads are loose or broken, old threads should be tightened, new threads added on, and the whole made firm by resewing.

Equipment: Paste brush, darning needles, bonefolder, and weight, waxed papers, coppered wires.

Supplies: Thread, paste, lining paper.

Method of Procedure:

1. Remove super from cover.
2. Remove paper from super.
3. Tighten threads.
4. Tie on new threads.
5. Resew book.
6. Put waxed paper between super and fly leaf.
7. Apply paste to super.
8. Remove waxed paper.
9. Close cover and "iron" well.
10. Test hinge by opening cover.
11. Insert fresh sheet of waxed paper between cover, and first fly leaf.
12. Rub down joints.
13. Set joints with coppered wires.
14. Put under weight to dry.
15. Paste lining on covers.

HAWAII'S STANDARD ONE-ROOM SHOP BUILDING.

Industrial Arts Buildings in Hawaii

F. S. Pugh, Eleele, Kauai, Territory of Hawaii

In Hawaii much progress has been made during recent years toward the goal of efficiency in industrial education. New courses have been added, modern buildings have been erected, and teachers are better prepared to teach the industrial arts. It has been the aim of the administration to economize as much as possible while still keeping Hawaii among the leaders of modern education. It is interesting to note, therefore, that the shops in every case, and many of the kitchens, are now being built to standard plans and specifications. Not only are the buildings standardized, but the equipment also is standardized as far as possible, so that when a new shop is built we know just how much it will cost and the list of repair parts kept in stock is reduced to a minimum. All of our standard tools are such as are advertised in the INDUSTRIAL ARTS MAGAZINE, thereby assuring the instructors that they are getting the best there is.

While the shop is standardized, it may be altered by moving the door location from the end to the middle, or the plan may be reversed, altogether depending upon the location of the shop itself. All shops have toilet and washing facilities, tool rooms with cabinets and shelves, ample locker room, and are well ventilated by the trade wind sweeping across the entire shop through the open shutters or windows. This type of window, or shutter, is especially well adapted to shop buildings in the Tropics, because they keep out rain and sun while permitting the entrance of fresh air. They are hinged at the top and kept open with a piece of wood about 36" long. The ventilator on the roof of the building also assures a cool shop at all times, in fact it is often several degrees cooler in the building than in the shade outdoors.

Double benches equipped with continuous screw vises are provided, and lately a special instructor's bench has been added. In addition, there is a metal working bench, a glue and stain bench, and bench to hold such tools as trimmers, dowel machines, bench drills, and saw vise.

There is no ceiling, and the lumber rack is hung from the ceiling joists although the heavier stuff is kept

STANDARD KITCHEN (LEFT) AND SHOP BUILDING, KAUAI, HAWAII.

underneath the building itself. The floor is of 1¼" edge grain northwest fir and the siding is of 1¼"x6" T. and G. with the rough, unsurfaced side on the outside. The roof itself is of corrugated iron. The building is stained with a green or brown creosote stain and the trim is painted white. The interior is gray up to the windows and white above.

Several of the larger shops are equipped with power machinery run by a gasoline engine. These are both Frisco standards and Novo engines, but we have adopted the latter as standard, simply because it is easier to install and does not require a special water cooling system. We have found the gasoline engine very easy to operate, and it has plenty of power. Students take care of the engines, but in the grades they are not allowed to run either the circular saw or the planer.

In the high school we are adding forge and machine shop equipment to the wood-working shop as well.

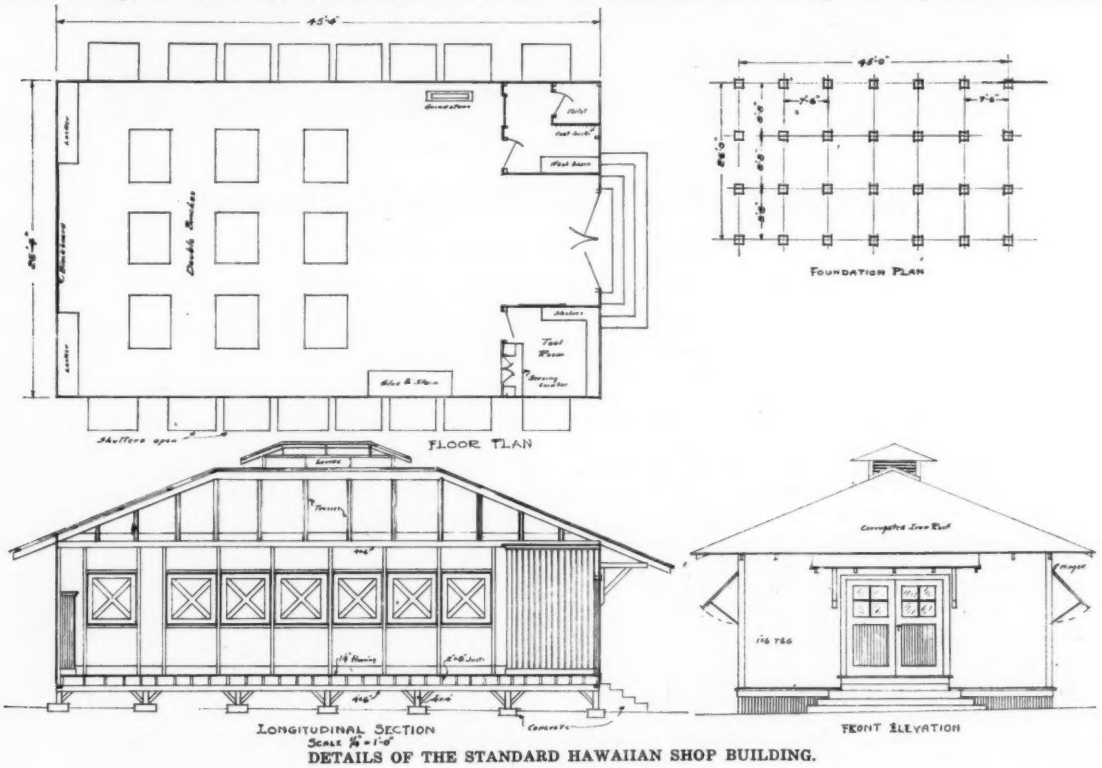
Much has been done toward standardizing the domestic science buildings, but the ideal has not yet been reached, mainly, because no two domestic science instructors can agree on just what is the ideal type. However, each new domestic science building is always a decided improvement upon the last one built. All kitchens include laundry tubs, serving counters, refrigerators, lockers for food and equipment, oil stoves, and hot water supply. Effort has been made to secure a suitable hot-plate for individual work, but all that have been tried have proved too complicated for children's use, and the common high chimney oil stove is now used exclusively.

Sewing rooms are attached to all kitchens and, in addition, some of the recently built domestic science buildings also have open air dining rooms attached, which are especially desirable in Hawaii's superb climate.

It may be of interest to mainland readers to know that all domestic science instruction is self-supporting, owing to the fact that each kitchen serves for cafeteria purposes as well. From 100 to 500 meals are served daily at an average cost of five cents.

New domestic science buildings will cost about $3,500, and equipment about $600. The shops average $2,500 for the building, and $650 for the equipment. Instructors of both shop and kitchen are paid the same, and may vary from $110 to $150 a month for grade teachers, according to preparation and length of service.

The kitchens are very popular with the public and children alike, and there is never any trouble in getting appropriations for new buildings. The hot noon lunch also benefits the children considerably, and in schools where kitchens are running efficiently there is a notice-



DETAILS OF THE STANDARD HAWAIIAN SHOP BUILDING.

A HAWAIIAN SCHOOL SHOP WITH AN OPEN AIR PORCH FOR WORKING DURING THE HOT SEASON. AT THE RIGHT AN INTERIOR OF STANDARD ONE-ROOM SHOP.

able decrease in retardation, and in the number of undernourished children.

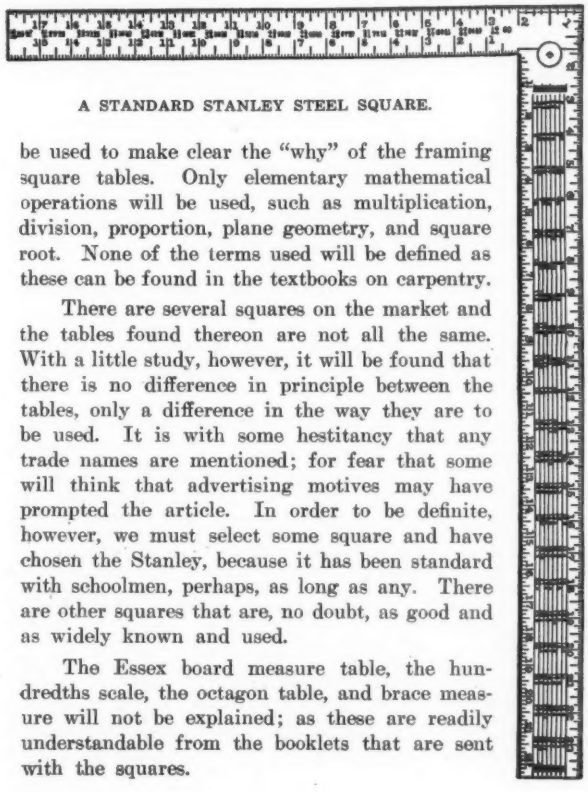
All dish-washing, cooking, serving, and cleaning is done by the children, and outside of Honolulu no janitors are to be found. Shops are swept up by the boys, and academic classrooms are cleaned daily by the students.

At present, the industrial supervisor in each county, or island, supervises work in domestic science, manual training, primary handwork, sewing and agriculture, but in the near future, owing to the rapid development of the industrial arts, it is planned to have special supervisors in each subject. At present the industrial supervisors are paid $290 a month on a twelve-month basis.

The Derivation of the Figures on a Framing Square

William L. Hunter, Manual Arts Dept., State University of Iowa.

Much space has been devoted to the use of a framing square while little, if any, attention has been given to methods of actual development of the tables. Few practical carpenters know how to use all of the figures on a square, and it is safe to say that very few can derive or supply one of the figures should it turn up missing. Schoolmen in the shop should care about the figures on a framing square and should be able to develop them. The method here given is only one of many that might



A STANDARD STANLEY STEEL SQUARE.

be used to make clear the "why" of the framing square tables. Only elementary mathematical operations will be used, such as multiplication, division, proportion, plane geometry, and square root. None of the terms used will be defined as these can be found in the textbooks on carpentry.

There are several squares on the market and the tables found thereon are not all the same. With a little study, however, it will be found that there is no difference in principle between the tables, only a difference in the way they are to be used. It is with some hestitancy that any trade names are mentioned; for fear that some will think that advertising motives may have prompted the article. In order to be definite, however, we must select some square and have chosen the Stanley, because it has been standard with schoolmen, perhaps, as long as any. There are other squares that are, no doubt, as good and as widely known and used.

The Essex board measure table, the hundredths scale, the octagon table, and brace measure will not be explained; as these are readily understandable from the booklets that are sent with the squares.

Holding the body or blade of the square horizontally, and with the tongue in our right hand, six rows of figures appear extending the length of the blade. These figures are further arranged in columns under each of the large figures on the square.

The first row contains figures which give the length of a common or main rafter per foot of run. For a half pitch roof look under "12," for third pitch under "8," etc., 24 being taken as the denominator of the fraction. Under "12" in the row mentioned, 16.97 appears, which equals $\sqrt{(12)^2+(12)^2}$. Under "8" 14.42 appears, which equals $\sqrt{(12)^2+(8)^2}$. "Twelve" is squared together with the figure that gives the required rise and the square root of the sum is extracted.

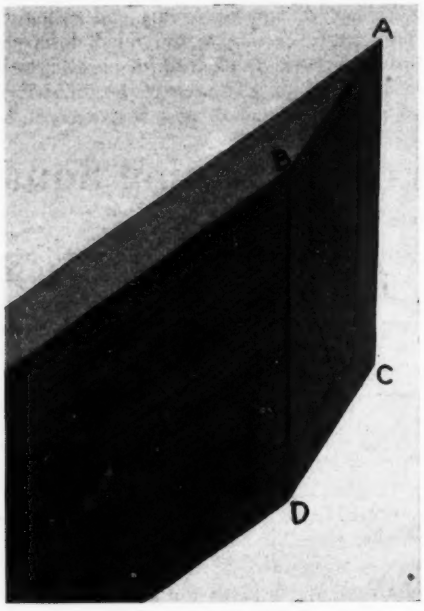
In the next row is given the length of hip or valley rafters per foot of run. Here as before we look under the large figure that gives the rise required. Since an ordinary hip or valley rafter runs at an angle of 45 degrees with the plates, when viewed from above, it is necessary to determine the diagonal of a rectangular parallelopiped. (A six-sided prism, all of whose faces are rectangles.) For half pitch each edge of the prism is 12" in length and the diagonal is obtained by $\sqrt{(12)^2+(12)^2+(12)^2}$, which is 20.78. For third pitch 18.76 appears under the figure "8" in the second row down and is equal to $\sqrt{(12)^2+(12)^2+(8)^2}$. For quarter pitch look under "6", which gives 18.00 and is equal to $\sqrt{(12)^2+(12)^2+(6)^2}$. The "6", "8", and "12" represent the rise for the respective pitches one-fourth, one-third, and one-half. For the other pitches look under the figure which, with 24 as the denominator of a fraction, will give the pitch desired.

In the third row the common difference in length is given for jack rafters spaced 16" apart and is found by the formula $\sqrt{(16)^2+(4/3 \text{ of rise per foot for pitch used})^2}$. For half pitch $\sqrt{(16)^2+(4/3 \text{ of } 12)^2}$ equals 22.625. For one-third pitch $\sqrt{(16)^2+(4/3 \text{ of } 8)^2}$ equals 19.23.

In the fourth row is given the common difference for jack rafters spaced 24" apart and is found by the formula $\sqrt{(24)^2+(\text{two times the rise for pitch used})^2}$. For half pitch $\sqrt{(24)^2+(2 \text{ times } 12)^2}$ equals 33.94. For one-quarter pitch $\sqrt{(24)^2+(2 \text{ times } 6)^2}$ equals 26.83. Remember

to look under the figure giving proper pitch to verify these calculations.

In the fifth row is given the figure to be used with "12" in marking the line for the side cut of a jack rafter. This is a little harder to understand, but with the aid of the photographs little difficulty ought to be encountered. Surface ABCD represents the cut of a jack rafter that fits against the hip. AC is called the plumb cut and AB the side cut. To determine the line AB the square is placed on the surface G with figure "12" on the body of the square at point A. The tongue rests on surface G and the specific point on the tongue that is coincident with the line AR is determined by the pitch of the roof being considered. For half pitch "12" is used on the blade and "8½" on the tongue. The scribing for the side cut is done along the blade. For third pitch "12" is used on the blade and "10" on the tongue. These figures may

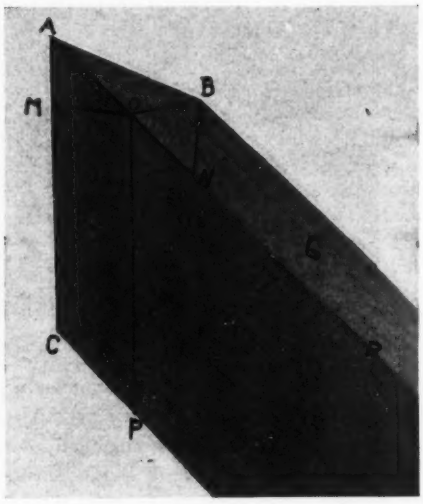


CUT OF A JACK RAFTER.

be derived as follows: Line AC is parallel to OP. Line MO is as long as the rafter is thick, in other words OB equals OM. BN is perpendicular to AB. AM represents the rise per foot for pitch used. In one-third pitch AM will be 8, MO will be 12, and OB will also be 12. By square root AO equals 14.42, and AB equals 18.76. By proportion from plane geometry AB : AO : : BN : BO. Substituting: 18.76 : 14.42 : : BN : 12. Solving: BN equals 15.61. But, reducing AB and BN proportionately so that AB equals 12, we see that 18.76 : 12 : : 15.61 : X. Solving: X equals 9.98. On the square for third pitch 10 is given which is very close to 9.98.

Similarly for half pitch OB equals 12, MO equals 12, AM equals 12, OA equals 16.97, AB equals 20.78. Solving for BN by 20.78 : 16.97 : : BN : 12 we find it equal to 14.63. Reducing AB to 12 and BN proportionately by 20.78 : 12 : : 14.63 : X we find X to equal 8.44, which is not far from 8½ given on the square for half pitch.

In the next row is given the figure to be used with "12" for obtaining the side cut of a hip or valley rafter. We can use the same figure for explanatory purposes as before, but the length of some of the lines will change. AM represents the rise per foot of run and remains the



ANOTHER VIEW OF A JACK RAFTER.

same, but MO and BO change. Instead of being 12 they now each represent 16.97, because these lines extend at an angle of 45 degrees with the plates when viewed from above. If we consider one-third pitch AM will equal 8, MO equals 16.97, BO equals 16.97, AO equals 18.76, and AB equals 25.29. BN equals 22.87 since 25.29 : 18.76 : : BN : 16.97. Reducing AB to 12 and BN proportionately by 25.29 : 12 : : 22.87 : X we find X equal to 10.85, which is very close to 10⅞ given on the square. This procedure will give the number for any pitch by using the proper rise for pitch considered.

These calculations were only carried two places beyond the decimal point and could be determined more accurately; but the carpenter seldom works to dimensions smaller than one-sixteenth of an inch anyhow. Do not think that a few minutes spent in reading this article will make the derivation of the figures on a framing square perfectly clear. Considerable thinking and some actual work in cutting rafters will quite likely be necessary before the explanations will seem clear. The framing square offers one of the nicest means of connecting up the shop with the work in mathematics. Few mathematics teachers care anything about the square, so it remains for the shop teacher to teach students to apply their knowledge in a practical way.

IOWA MEETINGS OF INDUSTRIAL ARTS TEACHERS

The Iowa Association of Industrial Arts Teachers, at its state meeting held each year at Des Moines, during the first week in November, has an attendance of all the delegates of the state and also representatives from the sectional meetings.

In the early spring, the state is divided into seven sections, each section holding its own meeting for the purpose of getting in closer touch with those who are not able to attend the state meeting. These sectional meetings, it is found, are centers of activity in which ideas are brought forth, discussed, tried out, and submitted to the state meeting for further discussion and approval. At the state meeting are taken up such matters as are of wide portent and may be successfully handled in the convention proceedings.

The state meetings for this year will occur during the month of April. A list of the meeting places and dates for the meetings follows:

Northeast	—Waterloo, Ia.	April 2, 3, 4
Central	—Des Moines, Ia.	April 9, 10, 11
Northwest	—Sioux City, Ia.	April 2, 3, 4
Southeast	—Muscatine, Ia.	April 2, 3, 4
South Central	—Shenandoah, Ia.	April 2, 3, 4
Southwest	—Council Bluffs, Ia.	April 2, 3, 4
North Central	—Fort Dodge, Ia.	April 2, 3, 4

PROBLEMS & PROJECTS

This department aims to present a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in benchwork, machine shop practice, turning, pattern-making, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are desired for consideration.

A JOB SHEET FOR HOME MECHANICS

F. E. Tustison, Menomonie, Wis.

The following job sheet describes the making of the heating element for the completion of the electric toaster outlined in the February issue. The asbestos slate for the job can be purchased from the Central Scientific Co., Chicago, Ill., or direct from Johns-Manville Co., New York. The resistance wire described (climax) is manufactured by the Driver-Harris Co., Chicago, Ill. They also manufacture other grades of resistance wire. Wire can also be obtained from the Hoskins Mfg. Co., Detroit, Mich.

Job Sheet
Home Mechanics (Elec.)
The Stout Institute
F. E. Tustison

Job Specifications: To make the heating element and the electrical connections for the electric toaster.

Reason for Job: We found how easy it was to make an electrical heating element. Today we will make an element for the electric toaster. If you will recall, a former element consumed about three amperes. A larger toaster must consume about five or six amperes. A larger wire must then be used to conduct this greater amount of current.

Material: Asbestos slate ⅛", climax wire No. 22, 4⅜" brass machine screws 4-40 with hexagon nuts, 6 brass hexagon nuts for 12-24 thread, $\frac{3}{16}$" brass rod.

Tools: Saw, $\frac{3}{16}$" and ¼" twist drill, small stock and die for 12-24 threads, hack saw, mill file and element winder.

Procedure: (1) Cut, drill, and assemble the slates. (Fig. I). Measure carefully, cut and drill accurately. Small piece No. 2 is bolted to the projection No. 1 so that the saw kerfs are together. The two saw kerfs form a hole through which the element wire passes to connect to the tangs. If the saw kerfs are not used, holes can be drilled after No. 2 is bolted to No. 1. No. 3 is bolted under the oval slot and is used to support the two tangs.

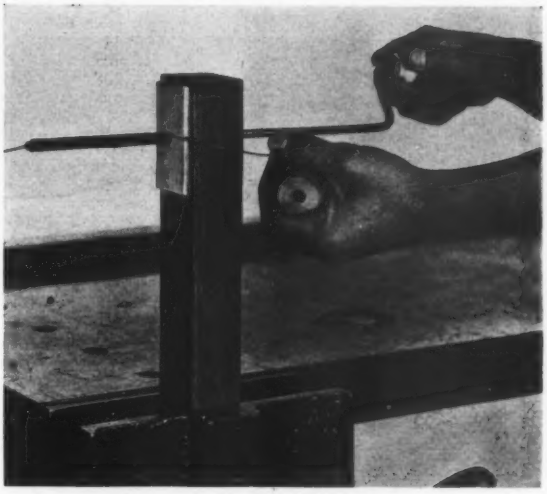


FIG. II—WINDING THE ELEMENT.

(2) Wind the element. (Fig. II.) An element winder can be made as shown. The ⅛" rod with the bent handle is inserted in a hole in the block. A piece of iron attached to the block will make the winder more permanent. Note the hack saw slot for guiding the wire. Wind with one hand feeding wire with the other. Cut 18½ feet from No. 22 climax wire and wind into a long coil leaving 8" at each end for connections. Double the 8" at the end and twist together. (See bottom of Fig. III).

(3) Divide the coil. Divide the coil into twenty euqal parts. Do this by measuring the length and dividing by twenty. Mark the twenty sections by separating coils with the knife.

(4) Thread coils on to the slate. (Fig. III.) Locate the center of the coils and start at the top threading one side at a time. Start so that the twisted end left for connection will fasten under the attached piece of asbestos slate. Do not stretch coil any more than necessary.

(5) Make and attach tangs. (Fig. IV.) The tangs are made from $\frac{3}{16}$" brass rod, 1⅝" long. Thread one end with 12-24 threads for ⅝". Chamfer the other end with a file so that the attachment plug will slip on easily.

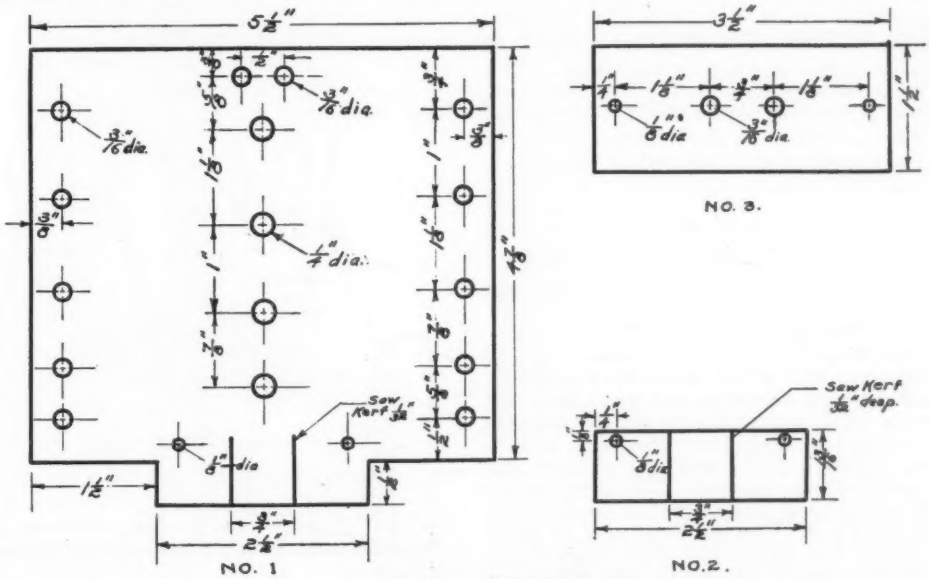


FIG. I—DETAIL OF SLATES.

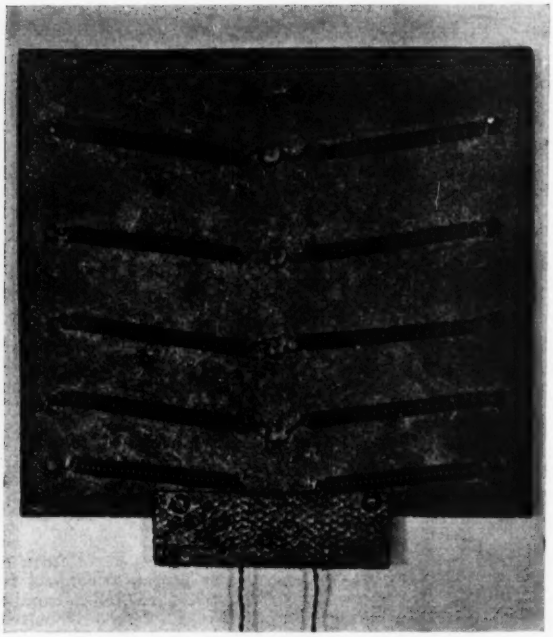


FIG. III—ONE SIDE OF COMPLETED ELEMENT. OPPOSITE SIDE CONTAINS THE SAME AMOUNT OF WIRE.

Fasten the tangs in place with two hexagon brass nuts.

(6) Insert the element in the frame. Remove the top and slip the element into place. Remove and file for any misfit. Attach the wires to the two tangs by adding another hexagon nut. Replace the top.

(7) Test. Connect the toaster and try with a piece of bread. The bread should toast with an even brown color.

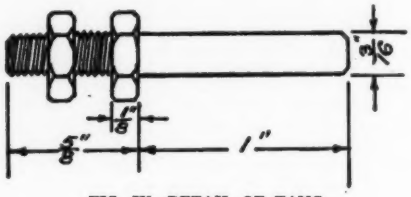


FIG. IV—DETAIL OF TANG.

Questions:

(1) What determines the amount of current a toaster uses?

(2) Why use larger wire in today's element?

(3) Why use asbestos slate?

(4) What is sometimes used instead of asbestos in other toasters?

References:

Keene: Mechanics of the Household, pp. 330-331.

Record:

Name..... Class.....

Date begun..... Date finished.....

Have you answered all of the questions?.....

Instructor's Grade.....

A METHOD OF FINISHING INTERIOR WROUGHT IRON WORK

Thomas F. Googerty

Decorative wrought iron made for the interior of buildings or houses should not be painted or electroplated. This finish destroys its character and takes away the beauty from this metal, at least in my opinion. Wrought iron work should not be finished with files, only where it is absolutely necessary. The work should show the rugged character of the material. The blows of the hammer add beauty to the metal, which cannot be obtained in any other way. Care should be taken in finishing a piece of iron with the hammer. The marks should surface and should be made with the flat face of hammer. Do not use the ball of the hammer to mark iron. These marks must be the result of the hammer in the making of the piece and not merely for the sake of making marks.

Most any piece of decorative iron made in the school shop can be improved wonderfully in its final finish. All of the sharp edges should be smoothed with a file. Afterwards heat red and cool to get a good fine coat over it. It should then be smoothed with emery cloth, care being taken to only rub the high places and leave the dark fire coat in the low parts. All of the projections should be smoothed down to a polish. This makes the work sparkle with life and gives it beauty. Of course the metal will not stay bright unless it is treated with some preparation to exclude moisture. A preparation that will do this and is invisible has been hard to obtain. One that I have used very satisfactorily is made from turpentine, varnish, and bees wax. I have found that metal will last indefinitely and retain its brightness provided it does not come in contact with water.

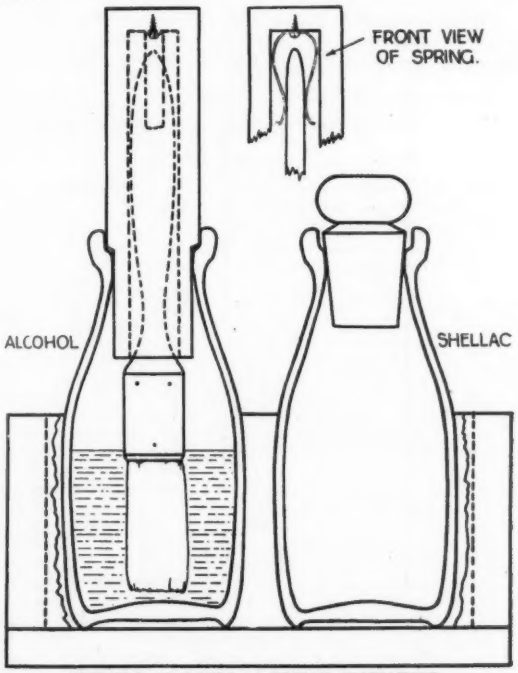
In preparing the mixture, about ten per cent varnish should be used with turpentine and about five per cent bees wax. The bees wax should be dissolved in turpentine. Put the turps in a bottle, add the piece of wax, and set the bottle in hot water. Afterwards put in the varnish. This preparation should dry flat unless too much varnish has been used. It is well to use all the varnish possible, but the mixture must dry flat and not have a gloss in the dark places on the work. The mixture can be applied with a rag. Rub it on well and then rub it off; enough will remain. Give it another coat when dry. Bees wax cut with turps, to a thick paste can be used afterward in the way used in finishing woodwork. This gives it another coat which will exclude moisture and add beauty to the work.

THE CARE OF THE SHELLAC BRUSH

Luther E. Hail

The accompanying diagram illustrates how I solved the problem of caring for the shellac brush. Ordinary half pint milk bottles, or any wide mouthed bottles available, were provided and stoppers turned from pine or basswood and drilled to allow for the handle of the brush.

The bottles are in pairs; one contains shellac, the other is for alcohol and the brush. The brush is returned to the alcohol when not in use. An ordinary varnish can stopper may be turned from basswood for the shellac bottle.



DETAILS OF SHELLAC BRUSH CONTAINER.

A small box is constructed from one-half inch basswood, large enough to hold the two bottles side by side with about a half inch clearance on all sides and deep enough to extend above the point where the curvature of the bottle starts. Plaster of paris is then poured into the box around the bottles.

A number of these are provided and one pupil from each class cares for them; he sees that they are returned to the cabinet and refills them when necessary. Each bottle is properly labelled. They cannot be easily upset and are always available in a form convenient to use and convenient to care for.

The brush is held in suspension in the alcohol by means of a small brass spring fastened to the handle.

Our paint, turpentine, and linseed oil are cared for in the same manner. This time the bottles are in sets of three; one for the paint, the second for turpentine, and the third for the linseed oil. One set is provided for each color of paint.

A SIXTH GRADE PROBLEM

Jos. J. Lukowitz, Instructor of Manual Training, Greenbush Street School, Milwaukee, Wisconsin

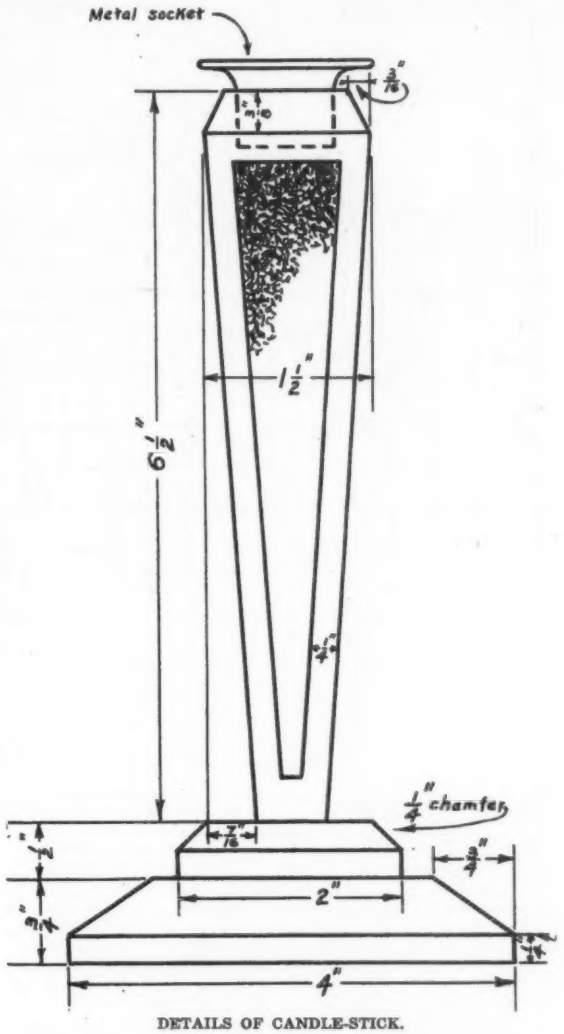
The accompanying drawing illustrates a problem which has been found to be very successful in the sixth grade shop work. It appears extremely simple in the drawing, but the finished article will redeem itself. Here is a chance to illustrate quite a number of tool operations with a minimum amount of material. Here, also, is a chance to show the boys how easily and effectively a surface may be enriched.

A pleasing two-tone effect is obtained by simply staining the entire candle-stick with one coat of the same stain, and then rubbing off all excess stain. The stain will penetrate the panel more deeply, because of its pierced and roughened surface, and the result will be a

THE COMPLETED CANDLE-STICK.

harmonious contrast between the panel and the rest of the project.

Those of us who work with beginners in shop work have formed the conviction that the boys learn more than they make, and that what they make is but the inevitable by-product of what they learned. The days of drill, drill,



DETAILS OF CANDLE-STICK.

drill, on joint making have passed. In that extremely formal type of manual training the by-product was worthless. But today, our drill is motivated by practical and useful problems which compel interest and appreciation. To the boys the finished product is the coveted goal, and it is up to us as teachers to set a worthy goal for our young charges, and then to guide them so that they may experience that encouraging sense of achievement which comes from the realization of a job well done—it is then that our educational efforts will bear the most fruit.

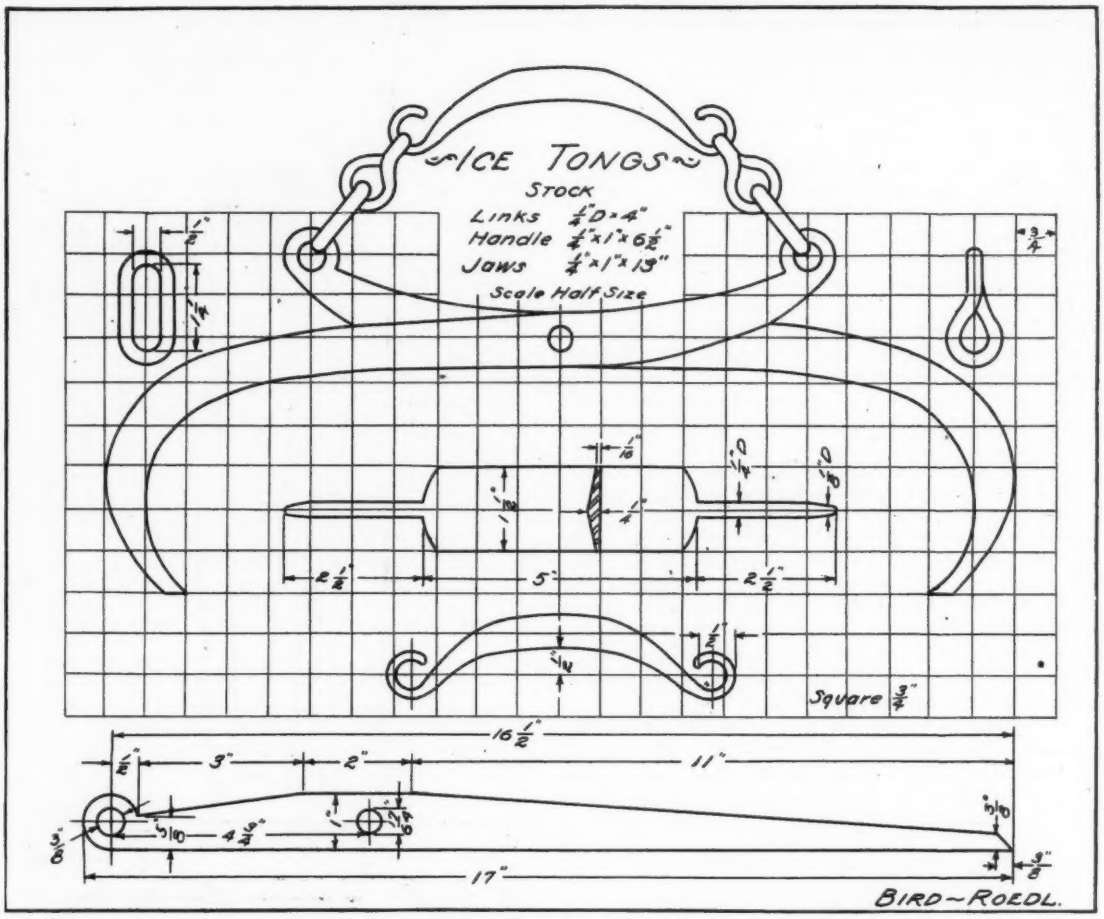
ICE TONGS

James P. Bird and Leo J. Roedl, Kansas City, Mo.

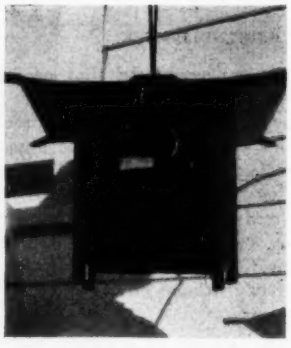
All homes have use for ice tongs, and as these involve several fundamental forging operations, they make a good project. The metal must be drawn, the eye punched and formed, the jaws bent to a templet, the links welded, and making the handle involves the use of fuller, flatter, and swage block. The jaws are also riveted and the points case-hardened.

In making the jaws a piece of stock ¼"x1"x13" will be sufficiently large. The eye is the hardest to form and should be made first. If the first eye is spoiled, it may be welded up, and another made on the other end.

Let the stock extend one inch beyond the round corner of the anvil and neck the stock down to ⅝ inch. Round up the end to one inch. Draw the other end out



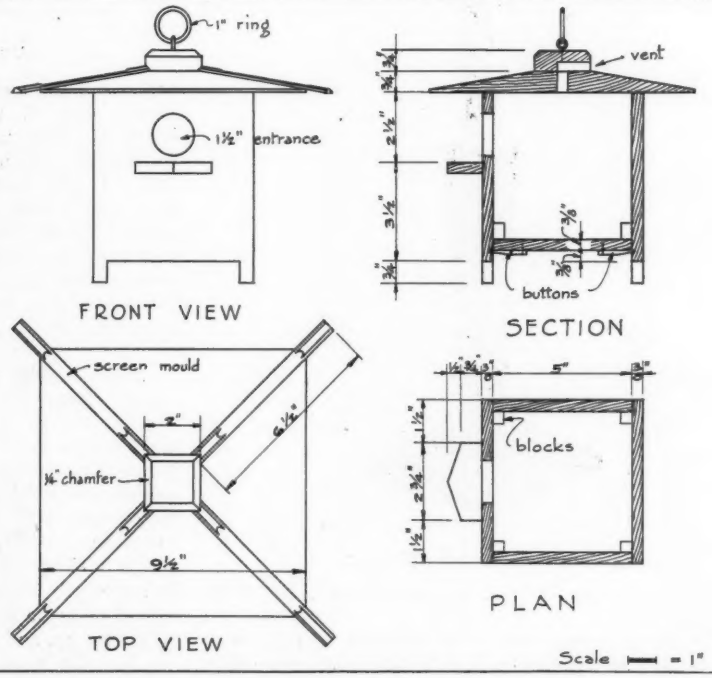
DETAILS OF ICE TONGS.



BLUEBIRD HOUSE

BILL OF MATERIAL

1	PC	¾"×9½"×9½"	TOP
1	PC	¾"×2"×2"	CAP
2	PC	⅜"×5¾"×6¾"	FRONT & BACK
2	PC	⅜"×5"×6¾"	SIDES
1	PC	⅜"×5"×5"	BOTTOM
1	PC	⅜"×1¼"×2¾"	PERCH
4	PC	6½"	SCREEN MOULD
2			BUTTONS & SCREWS
1			1" RING & SCREW EYE



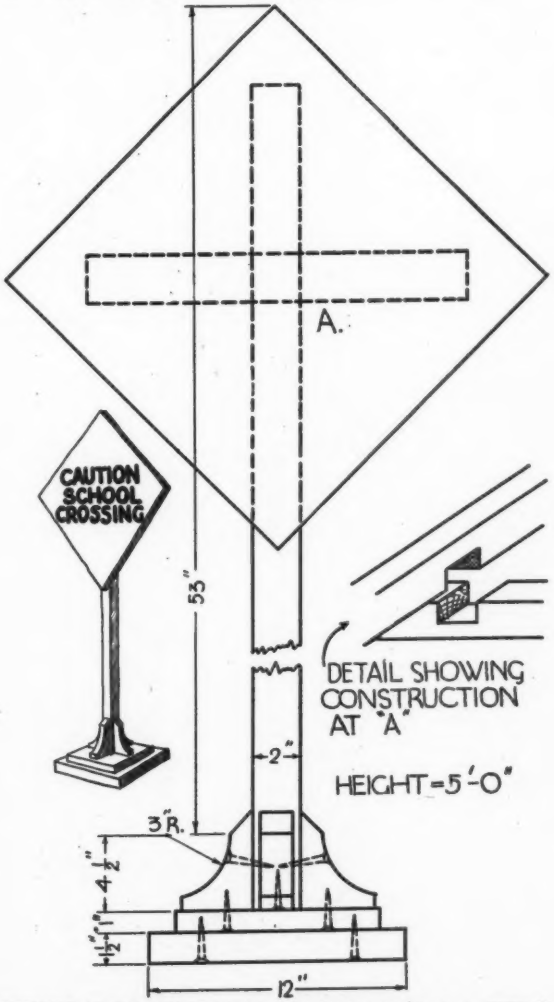
DETAILS OF A BIRDHOUSE DESIGNED AND MADE BY THE STUDENTS OF MR. GLADSTONE CALIFF, INSTRUCTOR IN SHOPWORK, RICHLAND, IOWA.

to correct dimensions, and make the second jaw conform to the first. Bend the two to fit the templet. Punch the eye and work the stock around the eye into circular cross-section. The handle takes a piece of stock ¼"x1"x6¾". From the center lay off 2½" both ways. At the 2½" mark, fuller in with ⅜" in top and bottom fullers, until the neck measures ⅜". Work both ends down to ⅜" square. Spread the 5" of the center by fullering until it measures 1¾" wide. Now trim the edges so as to make the central portion of the handle 1½" wide. Work the ends to finished dimensions. Next, bend the central part in the swage block, so that it becomes a semi-circle of one inch diameter. After this curve the same part over the horn of the anvil as per blueprint. The eye of the handle should be bent last. The links are next welded in place and the jaws riveted. File the points and case harden about one-half inch.

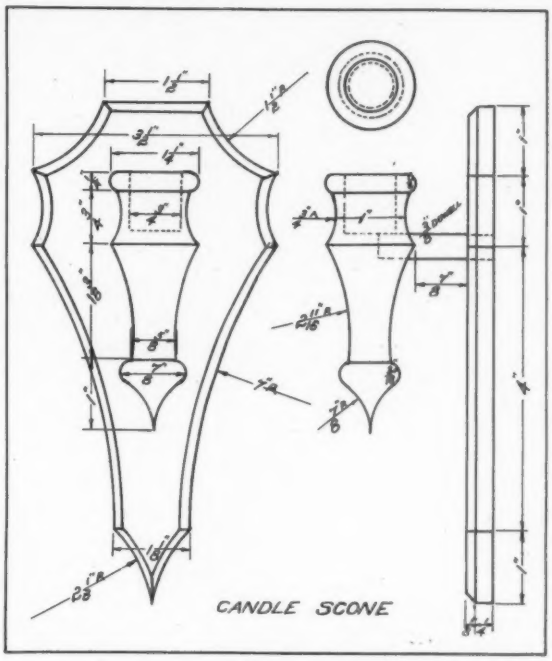
TILT-TOP TABLE

A. E. Bidney, Milwaukee, Wis.

The modern home has need for a variety of tables for decorative purposes and for a multitude of services. As a result, the tilting-top table has become very popular during the last few years, furniture factories imitating the tables of Chippendale and Phyfe. Tilt-top tables blend with most any period furniture; when not in use by a window or reading chair their tops may be tilted to display the design or beautiful figure of the wood and placed in a corner or against a wall space.



DETAILS OF SAFETY PROJECT DESIGNED BY MR. C. A. KUNOU, LOS ANGELES, AND MADE IN THE GRADES OF THE LOS ANGELES SCHOOLS.



DETAILS OF CANDLE SCONE, DESIGNED BY MR. J. L. MIDDAUGH, BENTON HARBOR, MICH.

The author designed this table, keeping in mind the characteristic features embodied in a table of this kind, which always has the tripod base—namely, three curved legs supporting the pedestal and oval top.

TILT TOP TABLE.

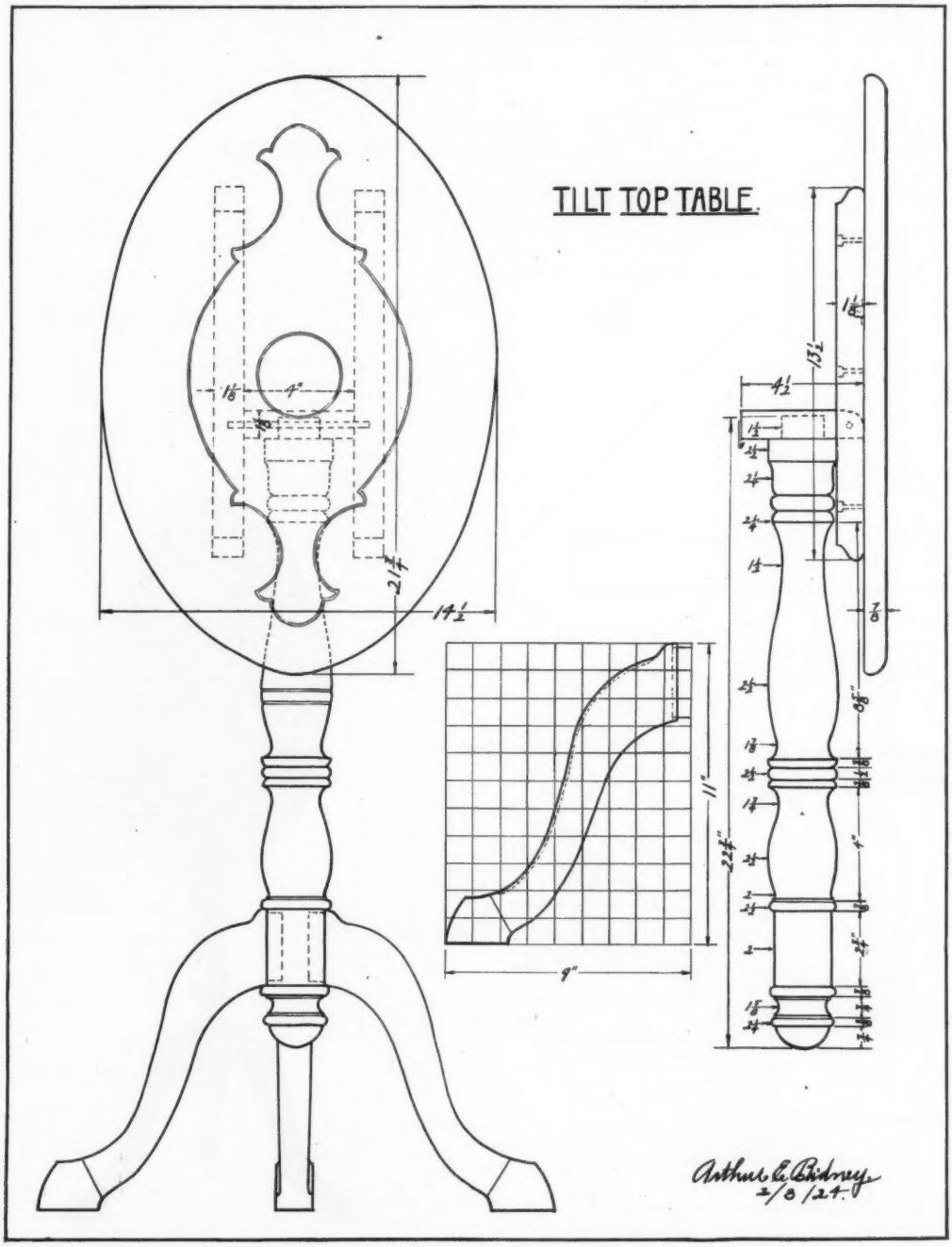
The top is held down by a small elbow catch and a bolt serves as a hinge. There is nothing particularly difficult or involved in the construction of the table, excepting the concave shoulders on the tenons.

Of course a table of this kind should be made of the better cabinet woods, this one being made of solid walnut and stained dark. The top was finished in the two tone effect, the design being left natural. Shellac, rotten-stone and wax were used in the finishing.

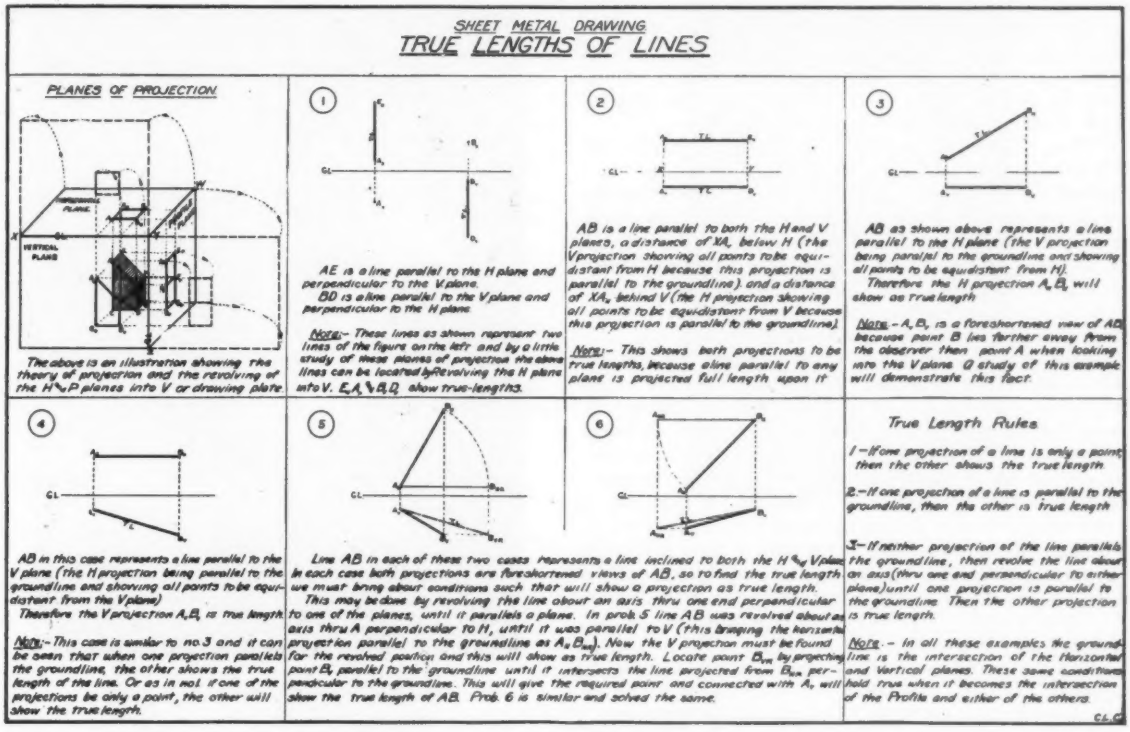
TRUE LENGTHS OF LINES IN SHEET METAL DRAWING

Charles L. Conroy, Vocational School, Manitowoc, Wis.

It has been the writer's experience in teaching sheet metal drafting that the majority of students have considerable difficulty in understanding the finding of true lengths of lines, especially of a line which is inclined to both planes it is projected onto. This condition is due to the fact that most students of mechanical drawing do not get a definite understanding of the principle upon which this subject is based — orthographic projection. That is, the relation of views, the reason why most drawings follow a certain plan, such as the top view being in the upper left part of the drawing plate, the side view directly beneath, and the end view in the lower right directly opposite the side view. Very few know what is meant when we say that our drawings are based on third-angle projection. Of course this may involve a slight amount of the fundamentals of descriptive geometry, but



DETAILS OF TILT TOP TABLE.


SHEET METAL DRAWING
TRUE LENGTHS OF LINES
PLANES OF PROJECTION
HORIZONTAL PLANE
VERTICAL PLANE
PROFILE PLANE
The above is an illustration showing the theory of projection and the revolving of the H & P planes into V or drawing plate
1
AE is a line parallel to the H plane and perpendicular to the V plane.
BD is a line parallel to the V plane and perpendicular to the H plane.
Note:- These lines as shown represent two lines of the figure on the left and by a little study of these planes of projection the above lines can be located by revolving the H plane into V. E,A, & B,D, show true-lengths.
2
AB is a line parallel to both the H and V planes, a distance of XA, below H (the V projection showing all points to be equi-distant from H because this projection is parallel to the groundline), and a distance of XA, behind V (the H projection showing all points to be equidistant from V because this projection is parallel to the groundline).
Note:- This shows both projections to be true lengths, because a line parallel to any plane is projected full length upon it
3
AB as shown above represents a line parallel to the H plane (the V projection being parallel to the groundline and showing all points to be equidistant from H).
Therefore the H projection A, B, will show as true length
Note.- A, B, is a foreshortened view of AB because point B lies farther away from the observer than point A when looking into the V plane. A study of this example will demonstrate this fact.
4
AB in this case represents a line parallel to the V plane (the H projection being parallel to the groundline and showing all points to be equi-distant from the V plane)
Therefore the V projection A, B, is true length
Note:- This case is similar to no. 3 and it can be seen that when one projection parallels the groundline, the other shows the true length of the line. Or as in no. 1 if one of the projections be only a point, the other will show the true length.
5
Line AB in each of these two cases represents a line inclined to both the H & V planes. In each case both projections are foreshortened views of AB, so to find the true length we must bring about conditions such that will show a projection as true length.
This may be done by revolving the line about an axis thru one end perpendicular to one of the planes, until it parallels a plane. In prob. 5 line AB was revolved about an axis thru A perpendicular to H, until it was parallel to V (this bringing the horizontal projection parallel to the groundline as $A_H B_{H_1}$). Now the V projection must be found for the revolved position and this will show as true length. Locate point B_{V_1} by projecting point B_1 parallel to the groundline until it intersects the line projected from B_{H_1} perpendicular to the groundline. This will give the required point and connected with A_V will show the true length of AB. Prob. 6 is similar and solved the same.
6
True Length Rules
1 - If one projection of a line is only a point then the other shows the true length
2 - If one projection of a line is parallel to the groundline, then the other is true length
3 - If neither projection of the line parallels the groundline, then revolve the line about an axis (thru one end perpendicular to either plane) until one projection is parallel to the groundline. Then the other projection is true length.
Note. - In all these examples the groundline is the intersection of the Horizontal and Vertical planes. These same conditions hold true when it becomes the intersection of the Profile and either of the others.
C.L.C.

A HELP FOR THE SCHOOL DRAFTING ROOM AND THE SHEET METAL SHOP.

I have found it highly profitable in the long run to spend a little time clearing this matter up right in the beginnng of a drawing course.

The projection box is an old idea and a mighty good one although it is not used as much as it might be. We made one for this department last year, one that is practical, easily demonstrated, not fragile or bulky, and easy to construct. I purchased three sheets of celluloid from the Dietzgen Co., (10"x10"x⅛") and these form the horizontal, vertical, and profile planes of the projection box, illustrated in the accompanying drawing. These are hinged with four small brass butts which can be bought at a local hardware store. The ones we used were about ¾" square with four holes about ⅛" diameter. The screws I picked out at the same time to fit these holes. To locate the holes place the planes and butts in a flat position as shown and mark positions of screw holes. I was unable to find a small tap, so drilled the holes small enough so I could turn the screws in (The celluloid will permit this as it is fairly soft) and cut their own threads in these holes. The hinge detail will show this construction. The base board is of white pine; the slots are sawed in to give a slip fit on the plane edges, and holes are drilled to hold the H plane supports. Cleats were screwed into the bottom to prevent any warping. For an object to represent a line I use a ¼" dowel 7" long with a long needle pressed into one end and sharpened on the outer end. This allows the dowel to be placed in any position and look suspended behind the planes. I then put a thin coat of white shellac on the outer plane surfaces to take chalk markings; with the object in position, its projections can be drawn upon the respective planes. There have been several constructions of this type of box shown, but this has proven to suit our needs better than the rest.

In my effort to bring out this matter of true lengths clearly, I made a chart which is shown here also, to illustrate the types of lines usually found and worked with in sheet metal drafting. These I divided into six cases. On the upper left of the chart is illustrated the idea and operation of the projection box with the object therein, a truncated rectangular prism. A study of this illustration will show its principles and with a little explanation the theory of finding true lengths is understood. In example No. 1, both lines will be noticed to be lines found on the object shown. Likewise with examples Nos. 2 and 4. Nos. 5 and 6 are not shown within the projection box illustrated for I leave it to the student to take the needle pointed dowel representing a line and place it in such a position that its projections can be drawn. Then he is told to revolve the line in the proper manner to have a projection show as true length. The various projections can be marked with a sub letter to distinguish them such as AH BH meaning the H projection of line AB. After this is mastered it can be shown that there are three possible ground lines to be considered, some developments calling for one, some for another.

I find this method of locating true lengths directly off the drawing saves considerable time and paper space. Of course there is the method of laying off true lengths to one side of the drawing by the use of right-angled triangles showing the base and altitude; in some cases it may be better to use it. But my results have been better with the above-mentioned method. I find some practical sheet metal men who rave about the schools not teaching the up-to-date methods of today such as Neubecker's short methods, etc. I can hardly agree with this attitude in the early part of the work, but I do think an instructor of this work should be thoroughly familiar with the advanced short methods to enable the brighter and quicker student to gain this knowledge is possible.

In summing up: it would pay us well for our efforts to put the student of both mechanical and sheet metal drawing on a better speaking acquaintance with this matter of projection, and instead of his gaining a more or less memory course in remembering certain operations to gain certain ends, he would understand every step and know where he was at every moment and why he was there. Even in vocational schools where many students lack a knowledge of geometry, this matter can be impressed on students if presented properly.